

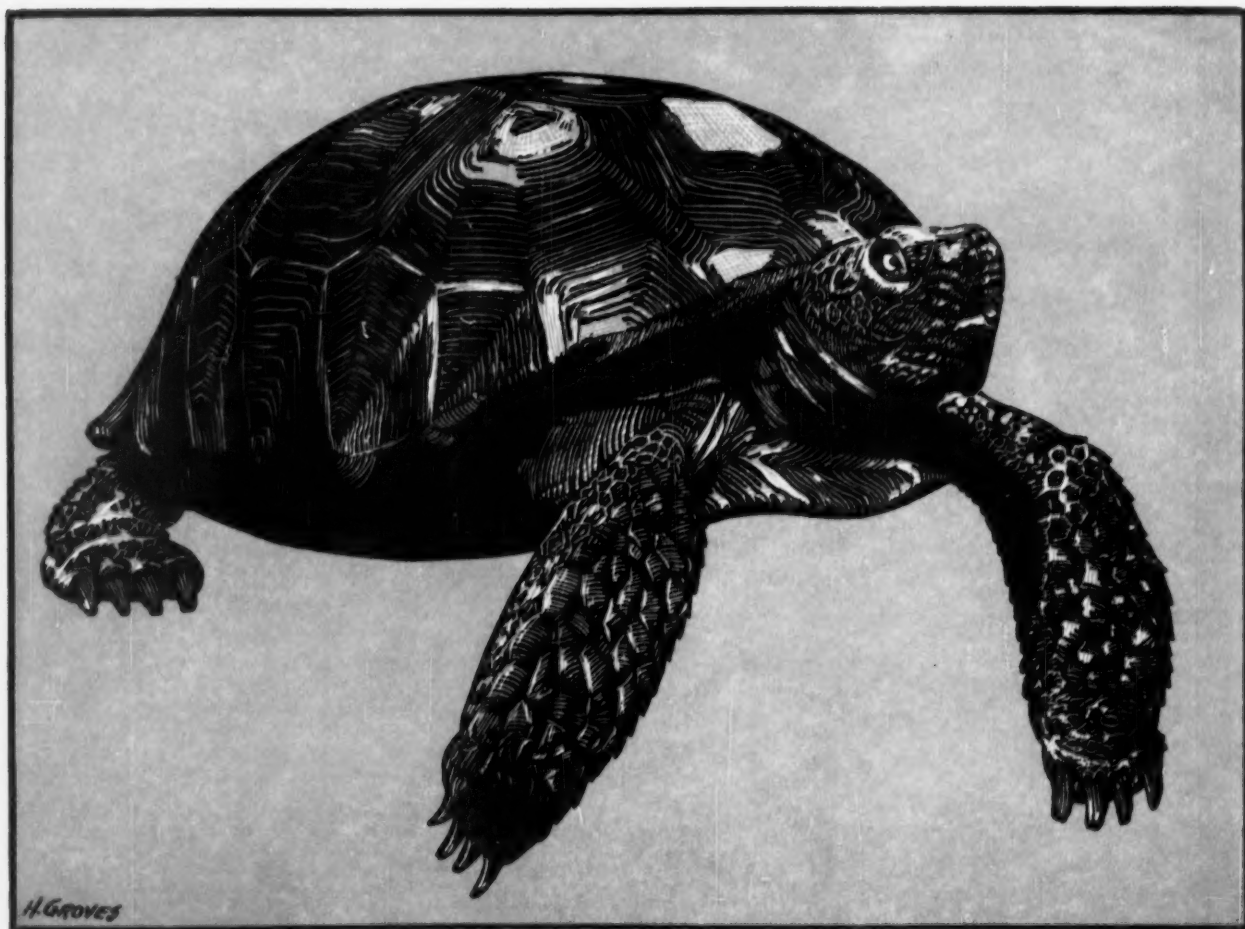
Nature *Magazine*

OCTOBER

1957

VOLUME 50 NUMBER 8

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Nature IN PRINT

After an exhausting summer, largely devoted to legislation seeking to establish a National Wilderness System, Howard Zahniser left for the West to visit wilderness areas and attend sessions of the Wilderness Society, of which he is executive secretary. It proved impossible, therefore, for him to prepare his usual book page this month.

John and William Bartram's America

Edited by Helen G. Cruickshank. New York 1957. The Devin-Adair Co. 418 pages. Illustrated by Francis Lee Jaques. \$5.00.

This is the fourth volume in the American Naturalists Series being brought out by this publisher and under the general editorship of Farida Wiley. Mrs. Cruickshank has made the selections from the writings of these Philadelphia naturalists, who explored our southeastern wilderness of the middle and latter part of the eighteenth century. She also provides an introduction and other related interpretive material. The America of the Bartrams is recreated in their writings and they provide an invaluable as well as fascinating picture of the country as it was. This volume is a fitting fourth in a series that has thus far included John Burroughs, Seton and Theodore Roosevelt.

Principles of Stratigraphy

By Carol O. Dunbar and John Rodgers. New York. 1957. John Wiley and Sons, Inc. 356 pages. Illustrated. \$10.00.

Stratigraphy, the branch of geology that unravels the complexities of sequence of the stratified, or layered, rocks of the earth's outermost shell, is a science in which great strides have been made since it was found to bear so directly on the economic life and welfare of nations. For example, the oil industry, so vitally important to our modern way of life, is outstandingly dependent upon correct interpretation of stratigraphic earth-features. Likewise, the uranium hunter of the Colorado plateau must possess some slight knowledge of the science, if his operations are to be based on anything but pure chance. Professors Dunbar and Rodgers of Yale University bring forth in textbook form the principles on which the geologically fascinating subject of stratigraphy is based. P.M.T.

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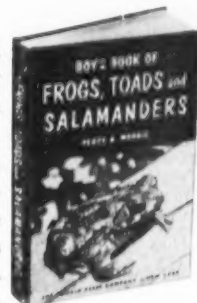
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WINIFRED DUNCAN. Charming illustrations book discusses world of the web-weaving spider, showing these creatures as superb architects, engineers, and trappers. Permits reader to eavesdrop on their seasonal activities. ". . . a lonely book. . ." *John Kieran*. 7 1/2 x 10. 175 ills.

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The Seashore Parade

MURIEL L. GUBERLET. This colorful book provides useful information about the plants and creatures that inhabit the seashore world. The story of their individual peculiarities and intense struggle for existence makes fascinating reading. "A good biology of the seashore world written down to the level of small boys and girls." *American Naturalist*. 6 1/4 ills.

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Nature Magazine

OCTOBER, 1957 VOL. 50 NO. 8

Published by the **AMERICAN NATURE ASSOCIATION** to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America

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Nature IN PRINT

Meditations of a Forester

By Elmer Shaw. Fort Collins, Colorado. 1957. Shaw-Craft Creations. 48 pages. Paper \$1.00; cloth \$2.00.

A research forester by profession and a technical editor for the U. S. Forest Service, Elmer Shaw has tried his hand at many other activities, from gandy dancing for the Southern Pacific to metaphysics and lecturing. His varied experience is reflected in this collection of 62 poems, light verse, bits of prose, a song or two, a salting of epigrams and fourteen line drawings by the author. He claims no attempt to be literary but is content with some creative self-expression that should be of interest to outdoors people.

The Living Rocks

By Stévan Célébonovic, with commentary by Geoffrey Grigson. Translated by Joyce Emerson and Stanley A. Pocock. New York. 1957. Philosophical Library. 96 pages. Illustrated.

In his preface to this book, André Maurois of the French Academy remarks that "God, according to the Greeks, is a geometer." The photographs that Stévan Célébonovic has taken and assembled for "The Living Rocks" make that old Greek notion seem quite plausible. Drawing on a number of Continental museums for his subjects, the author presents in a series of excellent full page black-and-white illustrations, the geometrical harmony of both crystallized minerals and fossilized plants and animals. Geoffrey Grigson's commentary is smooth and well suited to the work.

1000 Pleasure Spots in Beautiful America

By Marilyn Field and J. George Frederick. New York. 1957. Business Bourse. 245 pages. \$4.00.

This is a handy book to have around when you are planning your vacation or are on a trip. Its title is descriptive and the book represents an immense amount of compilation. Miss Field is a travel writer who has wandered widely, and Mr. Frederick is president of the Gourmet Society, and apparently has dined widely from coast to coast and north to south. We feel a certain special confidence in the gustatory validity of the book when we note that our favorite New York restaurant heads the list of mid-town eating places on the West side of the

city, A la Fourchette, 342 W. 46th Street. As to eating places in the nation's capital, we would be inclined to amend the gastronomic author's selections, as we would in other parts of the country. But that is a matter of opinion and, often, depends on what item you may have chosen on the menu. Hotels and motels are listed and advice is given on places of interest. The book covers Canada and the Caribbean, as well as the United States.

Universe Inside Me

By Laurence Barth. New York. 1957. P.O. Box 99, Village Station. 100 pages. \$2.00.

In a prefatory note the author is at loss to describe this book. He finds essay, poem and story all inappropriate, and is inclined to call it "an explosion." This seems to be about as happy a solution as any, although we found the book rather like a string of those tiny firecrackers of our youth; light the whole string and some exploded and some did not. There is some excellent and imaginative writing by Mr. Barth, but we are not sure just what he is getting at. Perhaps that is due to the fact that we could detect no theme that, to us, successfully tied his book together. But the author interestingly weds thoughts to words, even though some of the former we found unclear and some of the latter defiantly obscure. R.W.W.

Briefly Noted

The Trail of the Hunter's Horn. By Billy C. Clark. New York. 1957. G. P. Putnam's Sons. 95 pages. Illustrated by Veronica Reed. \$2.75. Story of a mountain boy of Kentucky.

Modern Applied Photography. By G. A. Jones. New York. 1957. Philosophical Library. 162 pages. Illustrated. \$4.75. British photographer writes on the use of photography as a tool of importance in science and industry.

Snappy the Snail and His Friends. By Marian Coates Kindelberger. New York. 1957. Greenwich Book Publishers. 31 pages. \$2.00. Children's stories for youngsters in the 6-10 year bracket.

Discover the Stars. By Gaylord Johnson and Irving Adler. New York. 1957. Sentinel Book Publishers. 146 pages. Illustrated. \$1.00. A beginner's guide to the science of astronomy and the earth satellite.

Journal of a Scientist. By Piero



INTRODUCING THE CONSTELLATIONS

by ROBERT H. BAKER

Beginning with the Dippers in the North, the author traces the groups of stars and their history as handed down by ancient astronomers and poets, together with the features of special interest to be seen with the naked eye, binoculars, or the telescope. The book has been completely rewritten to incorporate the latest astronomical discoveries. New photographs have been included, and a new chapter added, telling of the various amateur astronomical societies and their work, telescope-making, and literature of interest to those who cultivate the study of the heavens for personal pleasure. \$4.00

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AN ADVENTURE IN GEOMETRY

Written and illustrated by ANTHONY RAVIELLI



In concise text and brilliant graphic art, the wonderful world of geometry in nature is revealed. First the author describes the various geometric forms: triangles, circles, pyramids, spirals.

Then he shows how they occur in nature: "Spirals of snail shells and periwinkles swirl like an angry sea, while the rippling spiral of a clam shell is like the tap of a gentle wind on the surface of a placid lake." This book, with its many drawings of geometric forms and the natural objects reflecting them, will enable the reader to see the "bare and austere beauty that lies beneath the variegated trappings of the world." \$3.00

THE VIKING PRESS

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Modigliani. New York. 1957. *Philosophical Library*. 136 pages. \$3.75. Musings of a scientist and industrialist.

Moles and Shrews. By Charles L. Ripper. New York. 1957. *William Morrow and Co.* 64 pages. Illustrated by the author. \$2.50. The younger reader will find this an interesting introduction to these creatures.

Luna. By Robert M. McClung. New York. 1957. *William Morrow and Co.* Illustrated by the author. \$2.50. Story of this beautiful moth for the quite young reader.

Man-Eaters of India. By Jim Corbett. New York. 1957. *Oxford University Press*. \$4.50. Three books by this late writer gathered within two covers.

Orchids for Everybody. By Lee Wickham. New York. 1957. *Robert M. McBride Co.* Illustrated. \$5.00. The director of the Wickham Gardens of Odessa, N. Y., tells of his experiences with orchid growing and discusses many varieties.

Anthropology and Human Nature. By M. F. Ashley Montagu. Boston, 1957. *Porter Sargent*. 390 pages. \$6.00. A noted anthropologist devotes this important volume to enlarging the reader's interest and understanding of the nature of man.

The Genus Fitchia. By Sherwin Carlquist. Berkeley, California. 1957. *University of California Press*. 72 pages and 35 plates. \$2.50. Botanical discussion of this genus.

French Meadows. By Nellie S. Richardson. Springfield, Vt. 1957. *Springfield Printing Corporation*. 265 pages. A collection of 207 poems by this New England poet, and one by her daughter.

We Live by the Sun. By J. Gordon Cook. New York. 1957. *The Dial Press*. 192 pages. \$3.00. Popular story of light and how it affects our daily lives. A "Science for Everyman" book.

Virus in the Cell. By J. Gordon Cook. New York. 1957. *The Dial Press*. 208 pages. \$3.00. A book in the "Science for Everyman" series describing the battle against the tiny viruses.

Electrons Go to Work. By J. Gordon Cook. New York. 1957. *The Dial Press*. 192 pages. \$3.00. Popular story of the electron. A "Science for Everyman" book.

Mysteries of Science. By John Rowland. New York. 1957. *Philosophical Library*. 214 pages. \$6.00. A survey of the mysteries that still defy the scientist in many branches of science.

Toppy and the Circuit Rider. By Barnett Spratt. New York. 1957. *Abingdon Press*. 128 pages. Illustrated by Leonard Vosburgh. \$1.75. Story for young people about pioneer life and mountain people.

The First Book of Mammals. By Margaret Williamson. New York. 1957. *Franklin Watts*. Illustrated by the author. \$1.95. Simple introduction to mammal life.

Zoo Doctor. By William Bridges. New York. 1957. *William Morrow and Co.* 126 pages. Illustrated. \$2.95. Doctoring zoo animals calls for ingenuity and imagination, as well as veterinary skill, as this interesting book amply proves.

Play with Seeds. By Millicent E. Selam. New York. 1957. *William Morrow and Co.* 96 pages. Illustrated by Helen Ludwig. \$2.50. Introduction to seeds and their importance, and what you can do with them.

Free Diving

By Philippe Tailliez, Frederic Dumas, Jacques-Yves Cousteau, Jean Alinat, F. Devilla, P. Cabarrou and R. Perrimond-Trouchet. New York. 1957. *G. P. Putnam's Sons*. 185 pages. Illustrated. \$4.00.

The authors of this book are members of the Undersea Research and Development Group of the French Navy, several of whom were the first to dive with the Aqualung. In this book they deal with the mechanics and hazards of this sort of underwater activity. This volume is of primary interest to all who undertake this sort of sport and research opportunity.

Mysteries of the Pacific

By Robert de la Croix. New York. 1957. *The John Day Company*. 252 pages. \$3.50.

In 1785 le Comte de La Pérouse set sail on an expedition to map the South Pacific. He and his ships and men were never again heard from. In 1937 Amelia Earhart flew into the Pacific sky and was never found. In between these two disappearances there were other riddles posed by the vast and lonely expanse of this ocean. The author of this book discusses eleven of these riddles in fascinating fashion.

Cosmic Cyclones

By C. B. Vidas. New York. 1956. *Greenwich Book Publishers*. 71 pages, with diagrams. \$3.00.

In this book the author presents a revolutionary concept of the universe and the manner of formation of our planet. He advances, in popular terms, an interesting theory of Cyclonogenesis as the shaping force. In so doing he takes exception to conventional concepts of motion in the universe and puts forward a "concrete mixer" explanation. Cyclonic winds of great velocity, he contends, blew at a time when Earth was an infant planet. These winds scooped out the oceans and built the mountains of the coastal areas, the author asserts. Running counter to accepted theories, Mr. Vidas nevertheless makes a most interesting case for his conclusions, presenting his ideas clearly.

Wings of the Forest

By William J. Long. New York. 1957. *Doubleday and Company*. 239 pages. \$4.00.

Following the death of Dr. William J. Long, widely popular writer on Nature subjects earlier in this century, his daughter, Lois Long, found many unpublished manuscripts. This was a treasure trove, indeed, and some of these have been published in the magazine *Sports Illustrated*. A first book entitled *The Spirit of the Wild* gathered some of Dr. Long's Nature essays and stories, and enjoyed wide popularity. Now comes this second volume, equally full of the spirit of the outdoors and its creatures.

Camping and the Outdoors

By Larry Koller. New York. 1957. *Random House*. 128 pages. Illustrated. \$2.95.

This is a simple and practical aid to those who feel the call of the outdoors and camping there. Camping types are discussed, advice is given on tents, what to take along, cooking outdoors, keeping the camp, safety and first aid, understanding Nature, using map and compass, using ax and knife, cameras and binoculars and campsites.

The Edge of April

By Hildegard Hoyt Swift. New York. 1957. *William Morrow and Co.* 316 pages. Illustrated by Lynd Ward. \$3.95.

The author's enthusiasm and affection for John Burroughs is re-

flected in this biography of the "literary naturalist," as he called himself. She makes no attempt to write an exhaustive story of her subject's life but, rather, to make him live by careful selection of event and incident that will dramatize his life. Here is no fictional treatment, however, but a readable narrative based upon chosen factual material. This is a refreshing approach, and we are inclined to share Mrs. Swift's conviction that Burroughs would have approved of his biography thus presented.

Ferns of Ohio

By Harry E. Vannersdall. *Wilmington, Ohio. 1956. Curtis Book Store. 300 pages. Illustrated. \$3.09.*

This attractive book begins with brief essays on ferns as a hobby, the life history of ferns, Nature photography, conservation, the importance of Nature study in schools, and picturesque places in Ohio. Then follows an alphabetical listing of the species known in the State, with descriptions, distributional data, accounts of the writer's experiences in searching for rarities, and suggestions as to identification. For each species there are reproduced three large photographs, showing habitat, frond-outline, and details of spore-bearing structures. The charmingly written text is in refreshing contrast to the recently published crude and inaccurate "Field Guide to Ferns."

E.T.W.

Consider

By Clara Mills Ward. *New York. 1956. Exposition Press. 86 pages. \$2.50.*

This stimulating little book is a collection of interpretations of selected scriptural texts originally contributed by Mrs. Ward as a country newspaper column. Also included are some thought-provoking epigrams by Mrs. Ward's late husband, Charles E. Ward, as well as three radio scripts broadcast over Station XEXO. The theme of the entire book is metaphysical, and the author does not demand that the reader accept what she writes, but asks merely that the reader consider what she writes—hence the title.

Prehistoric Man

By André Leroi-Gourhan. *New York. 1957. Philosophical Library. 119 pages. Illustrated. \$4.75.*

In this story of man's evolution the author—archaeologist and professor—uses the most recent techniques and discoveries in the fields of archaeology and related sciences. The treatment is popular.

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Bog Area Saved

The conservation organization Nature Conservancy, of Washington, D. C., has announced its acquisition of a 200-acre tract near Norfolk, Connecticut, that includes a fine northern-type bog known as the Beckley Bog, to be preserved as a memorial to the late Senator Frederic C. Walcott of Connecticut, distinguished for his career in the field of conservation. A fine representation of northern bog flora is present in and around Beckley Bog, and the entire preserve is located in an upland forest of hemlock, white pine and northern hardwoods. Acquisition has been made possible through an initial fund of \$21,000, the contribution of many individuals and organizations.

Stamp Design

Daniel H. Janzen, director of the Bureau of Sport Fisheries and Wildlife, reminds artists that there is still time to enter the ninth annual Federal duck stamp design contest which opened August 1, and which will close November 1. The Fish and Wildlife Service will send prospective contestants on request a leaflet of contest rules and suggestions, along with an agreement covering reproduction rights. There is no limit to the number of designs an individual may submit, and the leaflet is free, from the Fish and Wildlife Service, Division of Information, Washington 25, D. C.

Hurricane Lore

Countless Americans, over the past few years, have been made painfully aware of the weather phenomenon called the hurricane. The United States Weather Bureau, which is responsible for issuing hurricane warnings, has prepared a number of articles dealing with the nature of these often-destructive tropical storms, the tolls they have taken, safety precautions that should be observed by citizens living in areas likely to be visited, and the types of warning services furnished by the Bureau. The articles are available on request from the U.S. Weather Bureau, Washington 25, D. C.

Reindeer Problem

The 29 reindeer placed on lonely St. Matthew Island in the Aleutians as a wartime emergency food measure have multiplied to a present count of about 800, reports the Fish and Wildlife Service. As there are few

OCTOBER'S AUTHORS

Dr. Eibl-Eibesfeldt, an Austrian by birth, is a biologist on the staff of the Max Planck Institute of Buldern, Germany. . . Lewis A. Carter lives in Milton, Massachusetts, is an employee of the Massachusetts Department of Natural Resources and an enthusiastic proponent of the acquisition of Cape Cod dune-lands for public preservation. . . Jerry Stillwell and Norma Stillwell have been in lifelong sympathy with the aims of conservation; after Jerry's retirement, they have devoted themselves to the recording of bird songs. . . Harold V. Green, article writer and student of natural history, is supervisor of the photography-microscopy section of the Pulp and Paper Research Institute of Canada, at Montreal. . . Alden S. Wood is editor of New England Mutual Life Insurance Company's house magazine, in Boston, and a free-lance writer. . . Weldon F. Heald, long-time contributor to conservation publications and member of the Sierra Club, makes his home in Tucson, Arizona. . . Noel L. Roberts contributes to *Nature Magazine* from the land "down under," he is a writer-photographer, a member of the Royal Australian Ornithological Society, and a resident of Sydney. . . Clay Perry, who lives in Pittsfield, Massachusetts, is an old hand at the art of speleology—cave exploring, in plain English—and the author of many articles on the subject. . . George W. Cornwell is a science teacher in the public school system of New Troy, Michigan.

natives and predatory animals on this 22-by-2-mile island, the herd has now exceeded the carrying capacity of its range, and will face eventual starvation. Two wildlife biologists of the Service have been assigned to study conditions on St. Matthew prior to formulation of a herd-management program. The island is a part of the Bering Sea National Wildlife Refuge.

The Back Country

From Joseph C. Wampler, the archeologist-mountaineer of Box 45, Berkeley, California, you may request descriptive folders of the trips he will conduct this fall and next spring into the wild canyon and plateau country of the southwestern corner of Mexico's Chihuahua State, home of the Tarahumara Indians, "one of the few remaining seminomadic cave-dwellers in the world." Here the Urique and Mayo Rivers have deeply gashed Mexico's central plateau in Grand Canyon-like fashion, and the word "road" is more of a challenge than a convenience, an honest-to-goodness "back country" for the Nature enthusiast and those who love the wild places.

Bulletins

The Jackson and Perkins Company's catalog of roses and perennials, with its eye-catching display of rose and other blossoms in bright and lifelike color, has made its appearance for the fall season of 1957. Included in the array are seven new roses available for fall planting, three of which have recently been announced as all-American selections. A letter or card to P.M.T., *Nature Magazine*, 1214 16th Street., N. W., Washington 6, D. C., will secure for you a copy of this colorful, 50-page publication.

"Opals" is the title of a 16-page booklet of information and illustration concerning both the precious opal, and its less showy but commercially more valuable cousins, diatomite, diatomaceous earth and tripolite. With cover illustrations of the precious opal in natural color, it is forty cents, from the Cranbrook Institute of Science, Bloomfield Hills, Michigan.

"On the Water Front," a booklet published by The League of Women Voters of the United States, 1026 17th Street N. W., Washington 6, D. C., discusses the administrative, legislative and economic aspects of an increasingly thorny national problem, the equitable and economic use of the water supply. It is publication 242, illustrated, and may be obtained from the League for twenty-five cents.

"Corrosion and Wear Handbook for Water Cooled Reactors" is a 294-page book recently released by the Atomic Energy Commission, is edited by D. J. DePaul, and is sixth in an unclassified series on reactor technology. If you contemplate building an atomic reactor, and hope to keep your nuclear particles where they belong, this is solid meat. From the Superintendent of Documents, Washington 25, D. C., for \$2.50.

"Nature Notes" is the monthly voice of the Webster Groves, Missouri, Nature Study Society. The issue for July carries an interesting account, reconstructed from the notes of Richard P. Grossenheider, of a trip through Alaska with a Fish and Wildlife Service "bush" pilot in the course of his duties. A subscription to *Nature Notes*, for non-members, is 50 cents a year. The society is affiliated with the Audubon Society of Missouri.

Contents noted

BY THE EDITOR

THE BLIGHT OF ROADSIDE ADVERTISING was much in mind during our recent 3600-mile vacation trip in Massachusetts, Vermont, Quebec and Ontario provinces in Canada, and northern New York. This reflected our current concern with legislation seeking to regulate the advertising use of the highway environment of the 41,000 miles of new, limited access highways to be built. The Washington-Baltimore Parkway is, of course, pleasurably free of blight, but Route 40 from Baltimore to the Delaware Bridge is not as fortunate, and is, of course, also a now outmoded highway. The New Jersey Turnpike is fortunately still free of intrusion, as are the parkways that carry one across Westchester County, New York, and Connecticut, save for an uncontrolled stretch between Meriden and Hartford. The new Massachusetts Turnpike is a notable achievement in highway building, a joy to drive and is innocent of billboards except for one huge Amoco sign, the loneliness of which emphasizes its offensiveness. Scenic Route 2 to northwestern Massachusetts suffers here and there from rashes of smaller signs and occasional billboards, but Vermonters, alive to the beauty of their State, have largely protected their landscape along Route 7. Not so New York, where Route 9 from Port Kent to the Canadian line makes one wish he had stayed in Vermont. Canada's roadside advertising blight, at least to Montreal, and thence to Ottawa and Toronto, is largely confined to commercial areas. The New York Thruway is a true highway achievement and its clean roadside environment is a great credit. Thanks to parkways and protected turnpikes, it is now possible to drive pleasurably and safely most of the way on such a trip as we took. Certainly the public, which is to pay so dearly for the new modern highways, is entitled to similar protection along the stretches of highways that are to be.

"CHURCH WOODS" TO THE PILGRIM PIONEERS were virgin forest areas where they worshipped. William T. and Marsha Arms, naturalists of Leyden, Massachusetts, have launched a drive to bring such reservations into being again as a forest and Nature conservation program. They urge that individual owners of forested lands set aside five or more acres as permanent "Church Woods," both for their practical and spiritual values. Such acreage would serve in watershed protection, as well. Mr. Arms points to the famed "Cathedral in the Pines" at Rindge, New Hampshire, and the Joyce Kilmer Memorial Forest in Jamaica Plains, near Boston, as examples of what might be called "Church Woods." These two areas have, of course, a permanence that would be desirable for all reservations dedicated

under such a plan, which seems to us an admirable one. We have long urged the preservation of many small local sanctuaries for wildlife, and the "Church Woods" designation adds a spiritual significance to such areas.

CHEERS FOR THOMPSON CHEMICALS CORPORATION of Los Angeles and St. Louis. This concern has announced that it will no longer produce, distribute and research the presently known agricultural insecticides. After a twelve-year study the company concludes that the wide-scale application of these potent chemicals to agricultural crops is "at best palliative, and perhaps will prove dangerous and uneconomic in the long run." The statement points to the "imbalance of the fauna population" caused by the use of these insecticides, and says: "The ingestion of presently employed insecticide residues by humans and other warm-blooded animals is a correlative problem of a highly serious nature." The corporation will devote itself to research and production only of selective chemicals in this field. When DDT was first released to be followed by many other lethal insecticides—we warned of the very dangers that the Thompson Company now cites. Yet the chemical companies went right on producing and widely distributing more and more powerful killers with no knowledge of or concern for the effects upon humans, birds, mammals, other creatures, or soil organisms of importance to fertility. Such a policy is stupid and indefensible.

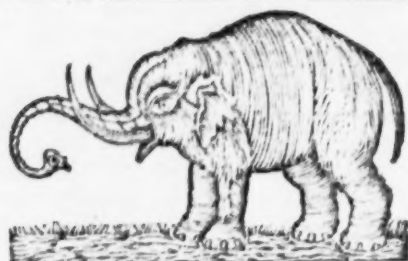
POLAR BEAR HUNTING BY AIR is on the increase, according to the U. S. Fish and Wildlife Service, planes being used to locate the animals on ice floes and then landing so that "sportsmen" can get a bear. This comes far from adding up to a sporting chance for these white dwellers of the North. Much of this activity takes place, however beyond the territorial limits of Alaska, and there is thus a jurisdictional problem. Assistant Secretary of the Interior Ross Leffler says that an act of Congress may be needed to make better protection of the bears possible. In the meantime the FWS Alaska staff is seeking more information on the management needs of the polar bear.

"THE GOLDEN CORN TASSEL" would be designated the floral emblem of the United States under S. J. Resolution 105, introduced by Senator Paul H. Douglas of Illinois. It would be chosen as "representing the beauty and the bounty" of our country. Through the years resolutions filed in Congress have sought to designate the goldenrod, the columbine, or the rose as the national floral emblem. None has progressed so far as a public hearing. Of the more than a million votes cast in the American Nature Association's poll of some years ago the wild rose led the field. It might add a pleasurable touch to the next Presidential election if several candidates for the office of floral emblem were nominated and placed on the ballot thus letting the public decide.

R.W.W.

...and a magnificent display of military...
 zons through the town, to Maj. RIPLEY's
 Tavern—On his arrival there, a salute was fir-
 ed by his Guards, which was answered by the
 Admiral—The whole was conducted with the
 utmost decorum, and in a manner which re-
 flected the highest honor on the different de-
 partments concerned in the Ceremonial.

The ELEPHANT which is now to be seen at
 Mr. LEE's Coffee-House in this City, is a na-
 tural curiosity, really deserving the attention of
 the public; We understand he is to be removed
 from this town on Monday or Tuesday next;
 all those, therefore, who wish to be gratified
 with a view of this Noble and Extraordinary
 animal will do well to call previous to that
 time.



The ELEPHANT,

IS now in this City, at the House of Mr.
 LEE, where he will continue for a few
 days.

This Animal came from Bengal to New York, was pur-
 chased for 10,000 Dollars.— He eats about 130 wt a day,
 and drinks a barrel of water— he is very fond of strong li-
 quors; Porter, Wine, &c. draws the Cork with his trunk &
 he is six years old, they grow till they are 40 or 50, to the
 height of 8 or 10 feet he is 7 feet high, measures in
 length 17 feet, round the body 13 feet, round his head 3
 feet, round his feet 3 feet 7 inches, he weighs 7,500, he
 travels 3, 4, and 5 miles an hour; he travels loose.

Admittance, A Quarter of a Dollar. Children Nine
 Pence.

No admittance twice, without paying twice. No admittance
 after sun set or on Sundays.

The Visitors are cautioned not to come too near the Ele-
 phant with papers in their pockets, as he has destroyed
 some valuable ones.

Hartford, May 10, '98.

LOAF & LUMP SUGAR.

LOAF and LUMP SUGAR by the Khd.
 for Sale at the New-York price.
 By FRANCIS BROWN & Co.
 Hartford, May 10, '98.

In its travels the elephant stopped in Hartford, Con-
 necticut, where "he" was, according to the *American
 Mercury* of that city, exhibited for a few days at the
 house of Mr. Lee. The date of this visit was May
 10, 1798. The clipping is from the newspaper of that
 date, and is by courtesy of the Connecticut Historical
 Society.

America's First Elephant

REVEREND William Bentley, the bustling, verbose,
 and friendly pastor of the white-steepled East
 Church in Salem, Massachusetts, hurried downtown on
 August 30, 1797, to go to the Market Place. On all
 sides he was surrounded by the sights, sounds and smells
 of the sea, for Salem, in the last years of the eighteenth
 century, was at the height of her glory as one of America's
 greatest ports.

Brawny tattooed sailors on work details scurried back
 and forth on cobbled Derby Street. Creaking wagons
 lumbered by, piled high with shoes and hides, meat and
 dried fish, rum and tobacco—Yankee goods of all sorts
 for the ships alongside the docks. In the harbor the
 Reverend Bentley could see the usual forest of masts and
 spars, the rigging of many ships sharply etched against
 the bright summer sky. Gulls fluttered around the
 elaborately carved figureheads at the bows of the ships,
 and filled the air with their cries.

As he hurried along, the Reverend Bentley's mind
 was far away from these familiar things, however. He
 was thinking of the great curiosity that he was about to
 see at the Market House. The good Reverend—a broad-
 minded clergyman and a renowned scholar of the classics,
 was also an avid student of natural history. He was
 going to see an elephant—the first such beast ever to be
 brought to America.

When he reached the Market House, he wormed his
 way through a good-humored crowd of jocular seamen,
 long-frocked merchants, and wide-eyed boys. There,
 in front of him, was the elephant at last. He gazed long
 and carefully at the beast. It was a small animal, as
 elephants go, only a little more than six feet high. Its
 skin was black, and looked as though it had been re-
 cently oiled.

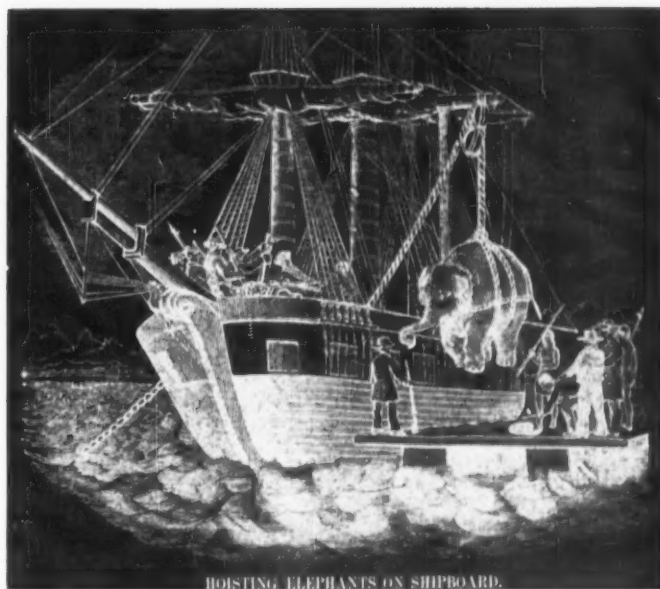
As Bentley watched, the elephant's keeper tried time
 and time again to mount the pachyderm's back, only to
 be thrown off each time. He assured the crowd, how-
 ever, that the elephant was accustomed to walking
 loose from city to city, and was perfectly tame. In
 spite of this, he cautioned the spectators not to come too
 close with money or valuables in their hands, as the
 beast had been known to snatch and eat such tidbits.
 Bentley noticed that, although the handbills advertising
 the elephant had referred to it as "he," the animal really
 was a female, with teats just behind her forelegs.

That evening Bentley faithfully recorded his observa-
 tions in his diary, adding: "The crowd of spectators

and the world in which
she lived

By ROBERT M. McCLUNG and
GALE S. McCLUNG

We are indebted to the Peabody Museum, Salem, Massachusetts, for this record of early elephant handling, as pictured in the first volume of Gleason's pictorial magazine. Below, the home of governors at the foot of Broadway, facing Bowling Green and the place where the pachyderm was first shown in New York. Courtesy of The New York Historical Society, New York City.



forbad me any but a superficial view." His general and detailed description of the beast belied these words. There was one thing, however, that he did not mention, but which he must have known. The elephant had been brought to America by a Salem sea captain in April of the previous year.

The *New York Argus* for Monday, the eighteenth of April, 1796, had carried the notice of the elephant's arrival in a short, but intriguing news item:

"The *America* has brought home an elephant from Bengal, in perfect health. It is a female, two years old, and of the species that grow to an enormous size. This animal is sold for \$10,000, being supposed to be the greatest price ever given for an animal in Europe or America."

Captain Jacob Crowninshield, native of Salem and captain of the *America*, had bought the elephant in Bengal for \$450, as his own personal "adventure" or investment. When he had reached New York with his prize, he had obviously not had any trouble disposing

of it. And true Yankee trader that he was, Crowninshield realized a profit of \$9550 on his original investment!

The new owner, or owners, who chose to remain anonymous in their publicity, immediately began to exhibit the elephant in a building on the corner of Broadway and Beaver Street in New York. This was a choice location, right in the business center of town. It faced Bowling Green and Governor John Jay's house—an imposing brick structure with high stone columns gracing its front. Just a block away was the Battery, a pleasant tree-lined park with a tall flagpole near the spot where the old Dutch fort had been.

Every day curious crowds flocked to see the elephant, as its owners trumpeted the virtues of their remarkable beast in newspaper advertisements: "To the Curious. The Elephant from Bengal, lately arrived on the ship *America* and purchased at the expense of Ten Thousand Dollars. This most surprising animal, the first that was ever brought to this country, is remarkable for its sagacity, its courage in war, and its attachment to its keeper. It is six feet and one half high, about two years old, eats thirty pounds of rice besides hay and straw, drinks all kinds of wine and spiritous liquors, and eats every sort of vegetable; it will also draw a cork from a bottle with its trunk. A convenient accommodation has been prepared at the corner of Beaver Street and Broadway, where this astonishing animal may be seen every day from 9:00 to 2:00 and 3:30 to 7:00. Select parties, on application will be admitted from 2:00 to 3:30. Price to grown persons 4 shillings. Children 2 shillings."

The crowds especially loved to watch the elephant stowing away food, using her trunk not only as knife,

Five Dollars Reward.



RAN away from the subscriber, on the 25th inst., a Negro Boy, named CUFF, tall, rather sloping forward. Had on, when he went away, a light cloth coloured jacket and olive trousers. Whoever will secure the said Negro, so that his masters may have him again, shall receive the above reward, by applying to

MARY IVERS, Bayard-street.
N. B. All masters of vessels are forbid harboring or carrying off the said boy at their peril.
April 21. 1796-d. 15.

TO THE CURIOUS.

The ELEPHANT,

FROM BENGAL,
Lately arrived in the ship *Admiral*, and purchased at the expense of Ten Thousand Dollars.

THIS most surprizing animal, the first that was ever brought to this country, is remarkable for its sagacity, its courage, its size, and its attachment to its keeper. It is six feet and an half high, about two years old, eats thirty pounds of rice besides hay and straw, drinks all kinds of wine and spirituous liquors, and eats every sort of vegetable; it will also draw a cork from a bottle with its trunk. A convenient accommodation has been prepared at the corner of Beaver-street and Broadway, where this astonishing animal may be seen every day, from nine o'clock to two, and from half after three to seven. Select parties, on application, will be admitted from two to half past three o'clock.

Price to grown persons, Four Shillings.
Children, Two Shillings.
April 23. 1796—d. 15.

TO YOUNG LADIES.

T. GREENLEAF

HAS, in addition to Dr. Gregory's justly celebrated *LEGACY TO HIS DAUGHTERS*, in English, and in French and English, just received, and for sale at his book-store, No. 54, Wall-street, neatly bound and entered, in 15mo.

Strictures on Female Education, in four Essays, by the Rev. John Beattie.

"Sale Partner, and sale Part of all things 'Tis,
"Dearest thyself than all." MILTON.

ROGERS & BERRY

INFORM the public, they intend deciding the retail business, and have resolved to dispose of their valuable and extensive stock in trade by wholesale, on the very lowest terms for cash or notes at short dates, their stock, among other articles too numerous to detail in advertisement, consists of an elegant and modern assortment of jewellery, silver, plated, and hardware, together with a numerous collection of books in Divinity, Law, Physics, History, and Miscellaneous, Stationary at every description.

May 3. 1796—d. 15.

TO BE SOLD,

A NEGRO WOMAN, 25 years of age, well acquainted with all kinds of house work, and the care of children; born in this city. Enquire at No. 222, Water-Street.

April 27. 1796—d. 15.

JAMES HUNT, TAYLOR,

HAS removed into town, and taken the house No. 112, Water-street, a door west of New-Slip, and is now opening, and has for sale, a general assortment of ready made clothes, which he will sell on the lowest terms for cash or short credit. Every description of writing apparatus for men, made at the shortest notice, at the same price with those ready made.

N. B. The highest price will be given to men or women who understand the business, and who are wanted immediately.

May 11. 1796—d. 15.

THIS DAY is published, and for sale by T. Greenleaf, No. 54, Wall-street, J. Livingston, 356, Pearl-street, Hugh Galois, 248, do. E. Duyckinck, 170, do. and by the other Bookellers, price 50 cents.

Pigot's Political Dictionary.

fork, and spoon, but as a container for liquids as well. Visitors offered her all sorts of things, some edible and some not, just to watch that wonderful trunk in action. New Yorkers loved a good show, and the elephant was all of that.

As a matter of fact, New York in 1796 was a good place for all kinds of entertainment. There were two large assembly halls for dancing, and two theaters. Several times each year the famous English equestrian, John Bill Ricketts, came to town with his "Circus," which featured fancy riding, stunts, and pantomimes. The city's first museum had been established just five years before, and was to be visited at the Exchange Building, just a block from the Battery. There, for the price of two shillings, the curious visitor could see a great assortment of objects of art, history, and natural history, along with a weird collection of curios and freaks. A modest menagerie, the city's first permanent live animal collection, had been set up near the Battery, too. The only animals it could boast of having when the elephant arrived, however, were a seal, a gannet, and a few other native specimens. The elephant was by far the stellar animal attraction in town, and its owner soon found that it was worth his while to stay in New York a month longer than he had originally intended.

On June 22, the beast and its master finally left town, heading south toward Philadelphia. In easy stages the elephant ambled through the pleasant New Jersey countryside, stopping frequently for exhibition purposes. The road she followed, cobbled in some places and unpaved in others, was well-travelled, for it was the main stagecoach route between New York and Philadelphia. Sometimes the elephant was put up for the night in a stable or barn behind some inn. More often she was kept in a barn by day and moved at night, in order to keep the curious natives from seeing her free of charge. She would swing along through the warm summer darkness at a steady three or four miles an hour, usually hearing only the common night noises—the hoot of an owl, the distant cry of a whippoorwill, the bark of a fox, or perhaps the yowl of a prowling tomcat. In spite of all precautions, the elephant sometimes met with an unexpected stagecoach or wagon, and there were undoubtedly some exciting moments when skittish horses reared in fright, or bolted at the sight and smell of this strange beast with tremendous flapping ears and dangling trunk.

On July 22, the elephant finally arrived in Philadelphia, where it was exhibited to the public at High (Market) Street, near Tenth. At this time, Philadelphia, with a population of 60,000, was the nation's capital while Washington was being built. It was a larger city than New York, and had a generally less crowded look about it. Even though it was supposed to be a staid city, its citizens supported such entertainments as boxing and cock-fighting, and flocked to fairs that ran all summer long. There were theaters and equestrian shows, and Peale's Museum of Art and Natural History. In such an atmosphere the elephant prospered. The proprietor took a new tack in his advertising, speaking of elephants in general, as they were described in the natural history books of the day:

"He possesses the adroitness of the beaver, the intelligence of the ape, the fidelity of the dog. He is the largest among the quadrupeds; the earth trembles under his feet; his strength is almost incredible; he has the power of tearing up the largest trees, and yet is tractable to those who use him well. He is endued with peculiar sensibility for kindness, but remembers injuries for years. In India these animals are yet used in war; they are powerful enough to bear towers on their backs, with cannon mounted, and ten or twelve men at the same time."

In early September the elephant left Philadelphia for a short swing east and south, and the municipal records of York, Pennsylvania, show that Christopher Stair, High Constable, received one pound, ten shillings as a fine from the "Persons Showing Elephant." The elephant did not venture west of York. Beyond lay the mountains and the wilderness, and the lusty, log-cabin town of Pittsburgh. West of that was only unbroken forest, with an occasional pioneer's cabin or primitive fort for protection against hostile Indians. Instead of venturing into this area, the elephant and its keeper proceeded south to Baltimore, where they remained for a month, and then returned to Philadelphia for the winter.

There was brisk competition in that winter of 1796 between the city's two theaters, as each struggled to surpass the other. Besides these two bulwarks of the legitimate drama, the indefatigable John Bill Ricketts was in town with his popular equestrian show and "circus," and for the really serious minded, a Mr. Fennell offered readings at College Hall on such subjects as Man, Life, and Procrastination. The circus and the theaters, however, competed for the biggest crowds.

In order to steal a march on his rivals, the manager of the New Theater decided to offer something really outstanding during the week preceding Easter. He engaged the English actor, Thomas Cooper, who was just at the threshold of his career as a famous tragedian, and arranged for the popular old standby, *Alexander the Great*, or *The Rival Queens*, a tragedy in five acts by Nathaniel Lee, to be presented for the benefit of Cooper. Then in order to make doubly sure that he would have a full house on opening night, he engaged the elephant to play the part in the play usually performed by a mechanical beast. The first and only live elephant in America should bring in the crowds as nothing else would!

On opening night the cream of the capital city's society made its way to the theater boxes—the men strutting like peacocks in their tight-fitting breeches and swallowtail coats; the ladies resplendent in gowns cut in the latest continental styles. With the "common" people crowded into the galleries and the pit, the theatre was jam-packed as the curtain went up on the triumphant entry of Alexander into Babylon.

"Hail, Son of Jove! Great Alexander, hail!" Trumpets flourished, gay ensigns waved and turbanned black slaves trembled. With a blare of martial music, Alexander and the elephant made their entry in regal splendor.

Nothing has been recorded as to the acting ability of America's first elephant, but the crowd could not have been more enthusiastic. Neither Mr. Cooper's between-act prologues, nor the play itself, appealed to the audience as did the elephant. And the elephant's owner, who received sixty dollars for that one night stand, ever afterwards used the stage appearance as publicity material.

The day after its theatrical debut, the elephant headed north again for a second visit to New York, and from there it started on an extensive tour of New England. In Providence, the *Gazette* carried a notice from the elephant's owner, who had remained in Philadelphia, cautioning the public not to trust William, the man attending the elephant, "as the proprietor will not pay any debt of his contracting." At the same time a handbill noted that the elephant would remain in Providence until the 8th of July only, as it was scheduled to appear at Cambridge for Harvard's forthcoming commencement exercises.

Something happened to this plan, for the elephant never got to the commencement. The program that the young graduates had to look forward to included a "forensic disputation upon the question 'Whether hope of reward

The travels of the famous elephant took it to South Carolina, where its arrival was announced in *The City Gazette and Daily Advertiser* of Charleston on December 27, 1798, along with varied other items of interest. Photostat courtesy of the Charleston Library Society.

for October, 1957

TOSE, Captain Bythewood, from Jamaica.
Application to be made to

Thomas Cave,
GUYER'S New Range :
Who has for sale
A large Quantity of Excellent PILOT
BREAD, and
Four hundred kegs FRESH CRACKERS.
December 27. eod 3

Five Dollars Reward.
D E S E R T E D from the Ship Commander, of
Philadelphia. TWO SEAMEN, viz.
LEVIN BLOTT, 22 years old, 5 feet 9 inches
high, brown complexion. JAMES FORREST,
24 years old, 5 feet 2 1/2 inches, dark com-
plexion.
All Captains of vessels are forewarned not to
employ them. The above reward will be
paid to any person who will deliver them to
the Subscriber, at NICHOLS'S Wharf.

Robert Lillibridge.
December 27. 3

H. COURTNEY
Has removed from Church-street, to
No. 42. BLAKE'S Buildings,
Meeting street, two doors north of the State
House. December 13.

Bloom Ralpins for sale,
At 15. 2d. by the single pound, and in Boxes
and Jars at the most reduced prices.
Also, SOAP, of a good quality, in Boxes.
J. R. Mauran,
Queen-street,
thru
December 6.

NEW SEED OATS,
Of an excellent Quality, for sale, at 25. 9d.
per bushel, if applied for This Day.
William Smith & Co.
December 21.

St. Augustine ORANGES,
FOR SALE, by
Andrew Mackenzie,
BROAD-STREET.
December 17.

Carpenters and Labourers.
The Subscriber wishes to hire, a few indus-
trious NEGRO CARPENTERS and LABOUR-
ERS, by the month, or year.
Thomas Bennett.
December 12. eod

TO HIRE,
A STEADY NEGRO MAN, would suit
best to attend a Wholesale or Retail
Store as a Porter. Apply to JAMES CUSTER,
PAIDOLAH'S Wharf.
December 13.

THE ELEPHANT.
THE Public are respectfully informed,
is now to be seen in QUEEN-STREET,
between Church and Meeting streets.

As this is a Curiosity which needs no puff-
ing allusive advertisement to recommend it, a
short description of this great WONDER
OF NATURE may be sufficient.

She was purchased near three years ago, in
New-York, for 10,000 Dollars, and has in-
creased in bulk since that time, about 1500lbs.
Her present weight is 3500lbs. and though
not half grown, stands 22 hands high, mea-
suring in length 17 feet, and girthing 13 feet,
8 feet round the head, and round the feet 16
inches.

She eats 150 weight per day, and drinks a
barrel of water; is very fond of strong li-
quors, and has frequently drank 40 bottles of
porter a day, drawing the corks with her
trunk.

If travelling, she will either lead, drive,
or follow, at the rate of 3, 4 or 5 miles an
hour, and is now from a journey of 1500
miles, without any signs of fatigue. She is
so docile and tractable, that she appeared in
the Procession of Alexander the Great, on the
stage in Philadelphia, before a crowded and
applauding house.

Doors open from sun-rise to sun-set, Sun-
days excepted.

Admittance, half a dollar; Children, half
price.

People of Colour, coming before 10 o'clock
in the morning, will be admitted for a quar-
ter dollar; past that hour, half a dollar.

Payment will be demanded for every ad-
mittance.

December 13.

The Elephant.

THE public are informed, that this most curious animal is returned from Philadelphia, on his way to Boston. He is grown considerably; and, to judge how tame he is, it is only necessary to remember that he appeared on the stage at Philadelphia. His stay in town will be but short; and, to enable every body to view him, the price has been reduced from Half a Dollar to a Quarter of a Dollar. To be seen at No. 110, Front Street. April 25.

"The public are informed that this most curious animal is returned from Philadelphia, on his way to Boston. He is grown considerably; and to judge how tame he is, it is only necessary to remember that he appeared on the stage at Philadelphia. His stay in town will be but short; and to enable every body to view him, the price has been reduced from Half a Dollar to a Quarter of a Dollar. To be seen at No. 110 Front Street."



The *New York Gazette and General Advertiser* records, on April 25, 1797, the return of the elephant from its triumphal tour, thus to enliven New York town and such scenes as that at Tontine Coffee House at the corner of Wall and Water streets. The photostat and the photograph of the oil on canvas by Francis Guy are courtesy of The New York Historical Society, New York City.

have as much influence on human conduct as fear of punishment," plus thirteen other such dissertations, including ones in Latin, Greek, French, and Hebrew.

In August, the elephant arrived in Salem, Massachusetts, home port of the ship *America*. It was then that the Reverend Bentley first saw the animal and described her so meticulously in his diary. The elephant stayed in Salem for a week, and then went on to Marblehead, Beverly, Newburyport, and finally returned to Boston for the winter.

At Christmas time the good Bostonians prepared a Christmas pudding for the elephant. It consisted of 75 pounds of rice, 25 pounds of raisins, 14 pounds of molasses, and a half pound of cayenne pepper. After eating this repast she became violently sick. As the story went, "the grocer, of whom the raisins were purchased, had inadvertently wrapped them up in a file of *Adam's Chronicle*, one sheet of which the beast swallowed." *Adam's Chronicle* was a Jacobin sheet, with inflammatory and politically radical views. As a result of this, "the pernicious effects of the paper were soon visible, and required all the skill of the most eminent of the faculty to overcome; and which was not done till she had eat a proportionate quantity of *Russell's Federal Centinel*." The latter was a conservative paper of unbesmirched respectability. Most Americans by this time had lost the sympathy which they had once had for the French, and were horrified by the bloody excesses of the French Revolution. The radicalism of the Jacobins especially alarmed them.

In the spring of 1798 the elephant headed south again, and by winter had arrived in Charleston, South Carolina. There advertisements noted that the elephant was "now from a journey of 1500 miles, without any signs of fatigue." They also stated that she had increased in weight to 3500 pounds, and that "though not half grown, stands 22 hands high, measuring in length 17

feet, and girthing 13 feet, 8 feet round the head, and round the feet 36 inches."

After the gay Christmas and holiday season in Charleston, the elephant left this capital city of the South and headed for Savannah. On the way she was encountered by John Davis, a tireless and knowing English writer who was exploring the young United States on foot.

One evening as Davis approached Ashepo, South Carolina, a small hamlet of three or four log cabins clustered around a crossroads, he saw what seemed to be the entire population of the place gathered by the roadside. When he was close enough to see what they were looking at, he gaped too. There, calmly receiving all sorts of proffered tidbits from the children, was the elephant. Bubbling over with curiosity, Davis hastened to meet the man in charge of her, a jovial Welshman named Owen, who was busy trying to console a monkey on his shoulder. The monkey was in a rage because of all the attention being given to the elephant.

After the Welshman had bedded down his strange charges, he and Davis had supper together, and shared a bed in the primitive log cabin that served as a stopping place for travelers. The next morning they all took to the road together, and as they walked along, Mr. Owen told the Englishman many strange and entertaining accounts of his travels with the elephant, which, unfortunately, were never recorded. Davis left the strange trio that afternoon, after eating lunch with them under the shade of a pine tree.

Late in March, 1799, the elephant reached Savannah, and was exhibited there for nearly two weeks. After that stay in Savannah, however, America's first elephant disappears entirely from the records. It is possible that she died about this time in some out of the way spot. In any event, she vanished without a trace, for no other southern cities profess to have seen an elephant during those early years.

(continued on page 442)

Dr. Eibl-Eibesfeldt has been one of the prime forces behind a growing international movement to save as much as possible of the unique but fast-disappearing flora and fauna of the Galapagos Islands. Dr. Eibesfeldt, representing the International Union for the Conservation of Nature, and accompanied by Dr. Robert I. Bowman of San Francisco, has recently embarked on another expedition to the Galapagos to determine which island or islands of the group might be best fitted for establishment of animal and plant preserves, and to examine sites for the installation of a permanent biological and conservation research station. Funds for the expedition have been made available by UNESCO, several American scientific organizations and by *Life Magazine*, while the government of Ecuador has furnished two naval units to assist in the work.

So ruthlessly has the Galapagos tortoise been hunted for meat and oil, that it is in imminent danger of being added to the list of creatures man has permanently extinguished.



PHOTOGRAPH BY ROLF BLOMBERG

Challenge of the Galapagos

By IRENAUS EIBL-EIBESFELDT

Photographs by the Author except as credited.

NOT LONG ago, an article appeared in an American newspaper of wide circulation suggesting that, if you wanted a change from your usual travel itinerary, you might do well to visit the Galapagos Islands. This lonely volcanic group, some hundreds of miles west of South America's Ecuadorian coast, is referred to as

"Ecuador's island resort"—a vacationer's paradise offering, among other things, "much wildlife to attract the hunter."

Now, the Galapagos Islands may stand in need of many things. The mail service may be a bit slow, and the conveniences that are associated with modern living may be a trifle on the shy side, but one of the things the Galapagos Islands definitely do *not* need is a considerable influx of gunners. For, despite the efforts of the government of Ecuador in decreeing protection for the unique fauna of the Galapagos, the

sober fact remains that wildlife benefits only slightly from the best of intentions, and where there are no guards to enforce the intent of the law, destruction proceeds with little interference.

In 1954, I had the opportunity to join an expedition to the Galapagos Islands, under the leadership of Dr. Hans Hass, to visit both the larger and smaller islands of the group, and to make an estimate of the present condition of the flora and fauna there.

Remember, if you will, that the wildlife of those bleak volcanic tops thrusting through the rolling blue waters of the equatorial Pacific was intimately associated with Charles Darwin's celebrated speculations concerning the evolution of life-forms. The archipelago of the Galapagos, situated more than 600 miles west of Ecuador, has never had any geological connection with the South American mainland. It is purely volcanic in origin, and the wildlife found on the islands has, in the course of time, evolved into some forms that are found nowhere else in the world.

In approaching the surf-beaten lava cliffs of the Galapagos—especially those islands that are devoid of human habitation—the visitor is first impressed by the great numbers of sea-lions and marine iguanas that draw them-



A Galapagos owl allowed the author to approach closely.



A male marine iguana, noting the approach of a rival, assumes a threatening position, with stiffened legs, erected crest and nodding head. The rare flightless cormorant, left, seems unperturbed by the prospects of an iguana-battle.

selves up on the rocks to bask in the warmth of the sun. The marine iguanas, reptiles commonly four feet or more in length, feed on marine algae, and there are different races of them inhabiting the several islands. Conspicuous among them is the colorful Hood species, the males of which have bright red flanks with black spots, while the top of the head, the crest, and parts of the back are emerald-green. The rest of the body, except the pale belly, is deep black, like the lava rock of their habitat.

The largest representatives of the marine iguanas are found in the central group. On Narborough Island, for example, the marine iguanas live in small herds, composed of a male and several females. The male occupies a certain area that is his territory, and he defends it against rival males in a way that is certainly worth mentioning.

On the approach of a rival male, the territory owner first tries to repel the invader by assuming a threatening posture. With crest erect, he stalks back and forth in front of his opponent with stiffened legs, gaping mouth and nodding head. If the rival ignores the landholder's belligerent attitude, the fight gets under way. Without biting, each reptile seeks to push the other off the rock. This is apparently a highly specialized manner of combat, for the marine iguana alone among reptiles possesses a head the top of which is armored with horn-like scales. The pushing continues until one or the other recognizes his impending defeat, and assumes a posture of submission, lying flat on his belly. The winner then waits for the victim to leave the field of battle.

There seems to be a strict code of behavior on this point, so that, while the loser is chastened, he is never seriously injured. The proceedings are all the more remarkable because of the sharp teeth possessed by the marine iguana. He could use these if he wished, but it would be prejudicial to the survival of his species. Hence the bloodless and ceremonial battle of the iguana males.

There are thirteen species of Darwin's finches in the



Galapagos Islands, all of these birds being descendents of one ancestral pair. One of these finches seems to have acquired the traits of the woodpecker; but not having a long tongue, it uses the spikes of cactuses as tools with which to stir insects from the crevices of bark! Seventy-seven of the eighty-nine species of birds that breed in the Galapagos are indigenous to the islands. Among them is a queer, flightless cormorant, whose helpless little wings are most un-birdlike. In the water, however, the flightless cormorant is an accomplished swimmer and fisherman.

On the uninhabited islands, the wildlife is amazingly—and perhaps unfortunately—unafraid of man. When I approached and tried to touch one of the marine iguanas, it nodded and moved aside, although in a quite unhurried way. Little doves and thrushes tripped past me unafraid, and one of the thrushes even tried to untie one of my shoelaces, feeling, probably, that these strings would make ideal nest-building material. The Galapagos buzzard and the Galapagos owl would sit near me without a trace of shyness, a fearlessness due, undoubtedly, to the

absence of any large carnivorous mammals on the islands.

The little Galapagos penguin, the sea-lion, and a sea-bear are representatives of the Antarctic, and probably floated along with the chilly Humboldt Current to the tropical archipelago. A Galapagos penguin that we once got from a fisherman escaped us. In the water, the penguin was extremely wary, and we failed in every effort to retake it. But an hour later, after both the party and the penguin had gone ashore, it could be picked up without the slightest difficulty. This special fear of the water seems to stem from an inbred dread of sharks, which are the only natural enemies of the Galapagos penguin.

This very tameness was, of course, nothing short of a death warrant for the wildlife of the Galapagos, when man arrived in the islands. Buccaneers and whalers first

reduced the Galapagos tortoise population, by the ship-load, for meat and oil, and the relatively few remaining tortoises are being constantly depleted by island settlers. The situation was further aggravated by the use, during the second world war, of South Seymour Island as a military base.

Perhaps some notion of the inroads made into the Galapagos tortoise population may be gained from the studies of the late Dr. Charles H. Townsend of New York, a man long interested in the fate of the Galapagos tortoise. Dr. Townsend estimated that during one thirty-year period, at least 200,000 of these reptiles were removed, during the heyday of the whaling ship. An investigation of the log-books of only seventy-nine American whaling vessels, preserved in the New Bedford, Massachusetts, public library, showed that these ships had made 189 visits to the islands between the years 1831 and 1868 to secure tortoises for ships' provisions, and that their combined catch was 13,013. These were the records of only seventy-nine ships. At one time there were more than seven hundred ships in the American whaling fleet alone, not to mention the fleets of other nations!

The government of Ecuador, realizing the peril to the wildlife of the Galapagos, established, in 1934, laws for its protection. But the enforcement of the laws, in a tiny archipelago far removed from the parent State, is another matter. For a modest sum, the visitor may still purchase the shells of freshly-killed tortoises, and the skins of the fur-seal and the sea-lion. Penguins and young tortoises are still being sold as pets. Further mischief is being done to an already critical situation by those invariable attendants to "civilization," poaching dogs and cats, which devour the eggs and young of both bird and reptile alike. (continued on page 439)



On the uninhabited islands of the archipelago, wildlife unfortunately has not acquired a proper respect for man's destructive tendencies. This young frigate bird gives the photographer an inquiring glance as he sits for a picture, above.

Young Galapagos sea-lions like their horse-play, but the big adult female seems to have missed the spirit of the moment, as she warns Junior off with a snarl.





"They commonly celebrate those beaches only which have an hotel on them. . . But I wished to see that seashore where man's works are wrecks, to put up at the true Atlantic House, where the ocean is land-lord as well as sea-lord"

From Thoreau's Cape Cod

MASSACHUSETTS DEPARTMENT OF COMMERCE PHOTOGRAPH

The Atlantic's waves lap on the stretch of Cape Cod's Great Outer Beach near Truro, Massachusetts. It is this beach and its adjacent hinterland that would be saved in a seashore park.

We have a unique national asset in

Cape Cod's Great Outer Beach

By LEWIS A. CARTER

SOMETIMES called Nauset Beach, the Backside, Cape Cod Beach or Great Outer Beach, a thirty-five mile fringe of sand stretches from Nauset Inlet at Orleans, Massachusetts, to Race Point along the Atlantic side of Cape Cod's crooked uplifted arm. This is the longest unbroken beach in New England, and the only major shoreline that has not been extensively developed in this region of the country.

Thoreau first walked the length of this beach, his black umbrella ballooning over his shoulder, in 1849. He described the great beach as "probably the best place of all our coast to go to. . . I do not know where there is another beach in the Atlantic States, attached to the mainland, so long, and at the same time so completely uninterrupted. . . certainly there is none where there is a double way. . . a beach and a bank, which at the same time shows you the land and the sea."

Explorers of the sixteenth and seventeenth centuries

knew this face of Cape Cod. Gosnold is credited with naming the Cape and, in 1602, recorded: "A mighty headland. . . a white, sandy and very bold shore." Before Gosnold, Verrazano, Sir Francis Drake and Champlain had seen it. Captain John Smith mapped the coast from Penobscot to Cape Cod and leaves this description written in 1614: ". . . only a headland of high hills of sand, overgrown with scrubby pines." On November 11, 1620, the *Mayflower* sighted the "very bold shore" and came to rest in Provincetown harbor in the sheltered lee of the outer beach.

In our own century Henry Beston writes: "A first glimpse of the great outer beach of Cape Cod is one of the most memorable experiences in all America. As one looks from the height of the earth-cliff which there confronts and halts the North Atlantic, it is the immense and empty plain of ocean which first seizes on the imagination, the ocean seen as one of the splendors of



NATIONAL PARK SERVICE PHOTOGRAPH

A view of the beach cliff and the adjacent country, which is dotted with many fresh-water ponds that were scooped out by the glacial age of the past.

earth and ever reflecting the mood of the season and the day. One may gaze at a mirror of summer blue ending on a horizon taut as a gleaming line; one may stare down into a vast and leaden turbulence of storm roaring ashore under another violence of sky."

This is the great beach that has inspired the comment of civilized man over the span of a thousand years. Most recently it was singled out by the National Park Service of the United States Department of the Interior as of outstanding significance in a 1956 report entitled *Our Vanishing Shoreline*. This publication was the result of a study, financed by private contribution, of the shorelines of the entire Atlantic and Gulf Coasts. Private funds have now been made available for a more detailed study of the beach, and its adjoining land area, as the basis for a possible national seashore park.

The pressing question of the moment is "how long will Great Outer Beach stay relatively unspoiled?" Fortunately the State of Massachusetts set aside, more than thirty years ago, the section of beach that lies west of Race Point and extends about three miles east and southeast. Named the Province Lands Reservation, this tract also contains ranges of mountainous sand dunes well-stabilized by heavy covers of bearberry, beach grass, bayberry bushes and beach plum. Next to this area is a two-mile stretch of beach, also backed by spectacular dunes, which is privately owned. A bill before the Massachusetts Legislature calls for the acquisition of this piece, the southern boundary of which is the town line between Provincetown and Truro. Below this is a three-mile arc of beach, with adjacent dunes and marshes,

recently acquired by the Commonwealth of Massachusetts as the Pilgrim Spring State Park. A few miles south of this commences the high bank, so vividly described by Thoreau. This has its southern terminus about twenty miles away at Nauset Harbor in Eastham. Within this portion, the beach and hinterland is privately owned except for a small Air Force Station, three Coast Guard stations, and a large Coast Artillery installation in Wellfleet. In a few locations south of this, both on the edge of the bank and around the ponds, are housing and cottage developments, some of which are small and at least two of which are extensive. Fortunately a few ponds remain unsettled in this general area.

The great bank running from Eastham to Truro was scooped out of the sand and clay by the glaciers of 35,000 years ago and piled up in a twenty-mile headland, which reaches heights of more than one hundred feet in places. The glaciers also dug out the little fresh-water ponds and a series of gullies which criss-cross Cape Cod all through this area. In the Cape hinterland today are forests of oak and pitchpine; bayberry barrens; the ponds; fresh and salt water marshes. No rock bolsters the formation of sand and clay that forms the backbone of Cape Cod. All is held in place only by the incredible strength of the beach grass, the ground-creeping bearberry, the forest growths and many shrubs. Seen from the air, this mighty bank appears to have been sliced off sharply as by a giant knife, mute evidence of the everlasting assaults of the Atlantic, which cuts great chunks out of its sandy slopes and slowly advances westward a few feet each year. The waste products of this erosion are swept



MASSACHUSETTS DEPARTMENT OF COMMERCE PHOTOGRAPH

Mountain ranges of high dunes near Provincetown. They lure the hiker and hold much interest to the visitor interested in dunes plants.

southward to Monomoy Point, south of Chatham, and to Provincetown in the north. The outer beach is always moving and changing its form in accordance with the shaping power of the winds and waves.

Cape Cod's position, half-way between the tropical waters of the south Atlantic and Caribbean and the cold waters of the Arctic, accounts for the bewildering diversity of its flora and fauna. It is a paradise for birds. Typical of the shore birds are the black scoters that float on the waves, the myriad herring gulls, and the dainty sandpipers that race over the sands on wire-thin legs. In the forests are many warbler species, chewinks, flickers and other birds. In the marshes and dunes are the red-wing blackbirds and the Ipswich and Savannah sparrows.

The Cape's geographical position makes it a landing strip for migrant birds that come in on the winds from many parts of the world at all seasons of the year. Autumn migratory winds have blown in the clay-colored sparrow from west of the Mississippi, and winter blasts bring in puffins, murres, razor-billed auks and snowy owls from the polar regions. Foxes, deer, rabbits and mice roam the woods and brush growths behind the beach. In the Atlantic waters race many beautiful gamefish—blues, striped bass, tuna and marlin, and there are more than three hundred species of shellfish found in this area. Since national parks do not permit the shooting of wildlife, these species of animals and birds would survive, if this area were preserved. Before the stands and cabins existed, the heath hen once strutted his nuptial dance. This bird, now extinct, a victim of "progress" and loss of habitat, made its last stand on Martha's Vineyard.

It is natural that some opposition has arisen from residents of the towns bordering Great Outer Beach. The strongest pressures against government acquisition of this area can be expected from real estate developers. This opposition has already been manifested, and will doubtless follow the pattern that has existed elsewhere to complicate the acquisition of national parks in settled regions of the country. Threats to the project lie in the rising prices of shoreline property and in the daily sales of land for beach cottages, housing developments, or other man-made ventures. With each sale, yet another means of public access to the beach is gone and the chances for success are that much dimmer. This threat is not as spectacular as that which endangered Dinosaur National Monument, but it is more insidious because it is not popular to move houses and people out of an area the resources of which, no matter how valuable, appear so intangible to the public. It is equally difficult for the public to realize the need of preserving unique natural and scenic wonders for the inspiration of future generations. A national seashore park is the most practical method of preserving the outstanding natural resources of Great Outer Beach.

Upon completion of the detailed study of the whole area, the National Park Service will make its recommendations. The creation of such a park will first require authorization of its acceptance, through Act of Congress. However, the actual establishment of the national seashore can come either through direct appropriation by the Congress, or through the acquisition of the area, or areas, necessary for (continued on page 439)

*There is adventure and
variety when you go*

Rambling for Bird Songs

By JERRY and NORMA
STILLWELL

Photographs by the Stillwells

At Mitre Peak Girl Scout Camp, in west Texas, a canyon wren sent its melodies cascading from the highest rocks, then repeated them from a lower boulder only forty feet from the reflector.

A snowy egret admires its golden slippers near Anhinga Trail in Everglades National Park.



WHEN NORMA Stillwell put the microphone of our new tape recorder in the study window, one April morning in 1948, she did not realize that she had started her husband Jerry on a new career. He was retiring, a few years earlier than usual, after nearly a quarter-century of technical editorial work for the American Petroleum Institute, in Dallas, Texas. This new approach to a lifelong hobby of bird watching was just

what the doctor ordered.

It takes plenty of time and patience to get good recordings of wild bird songs. As Jerry puts it, "Birds do not sing at the nod of a conductor, nor in a sound-proof room." The microphone that amplifies a bird song also turns a breeze into a tornado, and attracts the sounds of trucks, roosters, cows and dogs as surely as a magnet draws tacks.

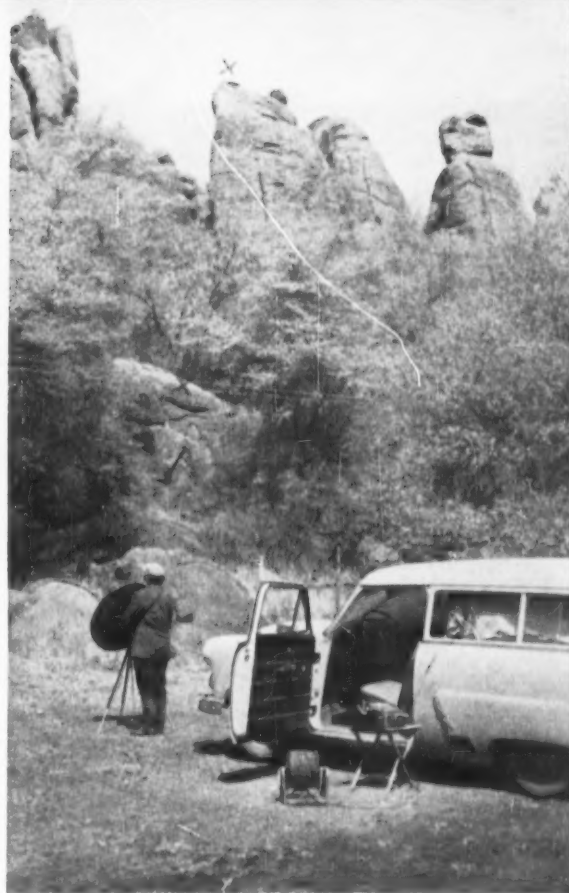
How often we have wished, as we played Boswell to the birds, that we had wings to follow them! Thus equipped, no swamp, mountaintop, trackless forest, tangled thicket or prickly desert could thwart us. We could get away from traffic noises. All we could then worry about would be noises of wind and water, find-

ing the birds we wanted and persuading them to sing for us.

One near-frosty dawn in June, we were parked at the edge of a tamarack bog in the Adirondacks, getting ready to record the high, rapid trills of a winter wren. Norma hastily unreeled a few feet of microphone cable, and carefully attached a microphone at the precise focal point, ten inches in front of the parabolic reflector. Jerry was unpacking and setting up the tape recorder. As he started to thread the machine, a full reel slipped from his hand, and two hundred feet of tape slithered to the ground in tangled spirals. Norma refrained from snickering as there flashed a picture of years ago, when she had stumbled over a tree root and spilled her camp breakfast of bacon and eggs into the sand. The wren was singing his best, while we both struggled to untangle and rewind that tape.

We shivered in padded winter jackets, but had to take off our gloves. Our fingers got so stiff that we finally gathered up the whole mess, climbed in the car, started the engine and heater, and thawed our fingers. By the time the tape was rewound, that winter wren had retired into the depth of the bog, and traffic was increasing. We had to drive thirty miles from our motel to the bog again, in morning darkness, but the wren song was worth it.

The winter wren has an exceptionally long song—eight or nine seconds of continuous notes, extremely high-pitched but musical. By slowing this song to one-sixteenth speed, which also reduces the pitch four oc-





From the patio of the Erl Morton home in Tucson, Arizona, were recorded songs of Gambel's quail, Gambel's sparrows and Inca doves, all interrupted by a cactus wren.



Ebony trees shade the tile roof of the headquarters building at Santa Ana Refuge, near the mouth of the Rio Grande. In this tract the Stillwells secured some fine recordings, despite many interferences.



One December was spent beside Tampa's Hillsborough River, in Florida, where a covey of quail ate grain at the doorstep of the trailer and soft-talked into the microphone.

taves, we counted about 165 distinct notes! As for his song pattern, or tune, the second half is practically a repetition of the first, except that the final trill slides down a little in pitch.

Our first red-letter day came when we recorded a pileated woodpecker in metropolitan Dallas County, Texas. The opinions of other bird watchers were corroborated, later, that pileated woodpeckers are neither as rare nor as shy as they were twenty-five years ago. We also recorded the species in Florida, Georgia and Arkansas and saw them in many other eastern States.

Our recording fever had now become chronic. We took our first look inside a house trailer, and decided then and there to sell our cottage in the wooded suburbs of Dallas, and follow the birds.

The lower Rio Grande valley region, including Harlingen, Brownsville and McAllen, is known in Texas as "The Valley." It is popular with ornithologists as well as bird watchers. For several years Irby Davis, with help from the Terry Gills and other experienced bird watchers in that area, had been sending in the longest Christmas census lists in the country. In the past few years, most of the native woodlands, thickets and brushy deserts have been cleared for cotton and vegetables. There remain the two large, but conscientiously guarded, federal refuges—Atascosa and Santa Ana.

Next to the Hackberry Woods, now nothing but a cotton field, a water-filled resaca, one of the outgrown cradles of the Rio Grande, was an extra attraction for birds. In fact, the birds were so numerous that about all we ever could record there was a mixed chorus. This was before we had our parabolic reflector. We did have two or three microphones hanging from likely-looking branches. Audubon's orioles fooled us at first, for they sound like a small boy learning to whistle. A Texas sparrow repeated his wiry, accelerated notes, all on one high pitch. Cardinals, thrashers, wrens and mockers swelled the chorus. The low moans of white-fronted doves, as well as red-billed pigeons, white-winged, and mourning doves could be heard in the lower octaves. A groove-billed ani flapped slowly over our heads, repeating his low, guttural notes. Jerry quickly got the tape in motion, but our later playback had no ani. In his excitement, Jerry had forgotten to turn on the near microphone.

On a desert tract west of McAllen, mesquite and prickly-pear cactus mingle with other thorny shrubs. Here we made our first tries for pyrrhuloxias, black-throated sparrows, and cactus wrens. Once we heard a wonderful antiphonal duet between a curve-billed thrasher and a mockingbird, but out of reach of our microphone. Jerry heard a strange, muffled clicking which he thought at first might be a go-devil being pushed through an oil pipeline crossing the tract. Years later, after a lucky recording near Tombstone, Arizona, he realized that the go-devil had been a scaled quail when we recorded not only scaled quail, but a desert (black-throated) sparrow, who treated Norma,

crouching behind the reflector only ten feet from the bird, as if she were just another cactus plant.

At Santa Ana Refuge, the tile-roofed headquarters building is shaded by ebonies, whose foliage is dark and dense in spite of finely divided leaves. This tract borders the Rio Grande, and in years of normal rainfall has three shallow lakes as well as dense woodlands next to tracts of cactus and mesquite. We have made so many recording trips to this refuge, during four different years, that we have lost count. We can, however, name from memory most of the birds we have recorded there, in spite of dogs and donkeys across the river in Mexico, and tractors, dusting planes, and pumping oil wells on this side.

Records worth saving include the ferruginous pigmy owl (the first evidence of its presence there); a barn owl, hooded orioles with weak and helter-skelter songs; raucous *cut-it-out* and screechy *keep-it-up* and other clatter from chachalacas (like dusky, half-grown turkeys); two song types from Texas sparrows; a dandy Sennett's thrasher song; green jays with plumage so much lovelier than their voices; a Derby fly-catcher arguing with a Harris hawk; great-tailed grackle; the dawn song of a Mexican crested flycatcher, white-fronted dove and red-billed pigeon (fair, in 1957), fairly good screech owl, cactus wren (a metronome, not a musician), a black-crested titmouse, not to mention more commonplace species.

One of our favorite trailer parks was in Thomasville, Georgia, in a sixteen-acre tract of natural woodland. Thomasville also stands for martins, recorded at Herbert Stoddard's plantation pole of calabashes, and the pinewoods sparrow taped in his rung orchard, and for contrary turkey, and convivial barred owls.

December of 1949 was spent beside the Hillsborough River at Tampa, Florida. Soft-talk from a covey of quail was our only bird recording here. Jerry taped several concertos and symphonies from radio programs. Thanks to Mrs. Brownsey, Norma added seven new birds to her life list, and learned the names of several new trees and shrubs. She recognized a palm warbler "because he wagged his tail."

"He doesn't wag his tail. He pumps it," corrected the technical editor. Norma finally did find an author who said "he wags his tail up and down."

Cypress swamps from east Texas to Florida look impenetrable yet intriguing, as if their watery aisles would lead to strange, mysterious adventures. At Wakulla Springs, in northern Florida, the unearthly screams of limpkins, the clacking rattle of a water turkey, the bass rumble of Ward's heron and loud calls of pileated woodpeckers only accented the prevailing silence. Sister Rena refuses to listen to our limpkin recording—she says it sounds like a woman being choked to death.

Anhinga Trail, the boardwalk into a swamp in Everglades National Park, is a Mecca for bird photographers. Herons, egrets, ibises, coots and gallinules have become indifferent to human intruders. Some even make gestures of friendship. Jerry claims that when Paul Kellogg,



In the high country of the Pacific Northwest, the songs of thrushes were heard faintly above the roar of streams fed by melting snow. This is Mount Rainier, as seen from Longmire campground.



From this dead pine by the ski lodge, on Whiteface Mountain in the Adirondacks of New York State, a purple finch rendered his swan song to the Stillwells.



On the post to the right perched the only Arkansas goldfinch whose song the authors have succeeded in recording. The photograph was taken near Walsenberg, Colorado, and in the background loom the Spanish Peaks.

the helpful pioneer bird recorder of Cornell, dropped his Sigma Xi key into that shallow swamp, a purple gallinule quickly probed the muddy bottom and laid at Paul's feet not only the Sigma Xi, but Phi Beta Kappa and Tau Beta Pi keys. The first time we visited the boardwalk, we failed to record the roar of an alligator because Jerry thought it was a truck stuck in the mud. We have not found the birds there very talkative, but have now accumulated characteristic calls of several species, despite the rumble of tomato trucks.

Many of the bird songs used on our first long-play record were made at our newly acquired rural home near Fayetteville, Arkansas, in 1951 and 1952. Our ten wooded acres deserved the name "Avian Echoes." We also chose it because it was two miles from a paved highway. Several improvements and additions had been made to our recording equipment. Every dawn without wind or rain would find four or five mikes hung in tree branches or brush piles around the place. Neighbors wondered how Jerry could climb some of those tall trees, until they saw him using a sling-shot and fishing line to draw a pulley-rope over a top limb. And Norma learned how to aim the new parabolic reflector that could make a bird sound five times closer.

Each of the five field sparrows around our place could be recognized by its own variation of the species song-formula. Our red-eyed towhee was especially hospitable. In addition to *drink tea*, and *drink your tea*, he sang *drink some more tea*. Our tufted titmouse had his own way of whistling *here, see here!* One of our indigo buntings began the spring with *pleased ta meetcha*—no more. Later, he added *no doubt*, and finally a lot of rapid notes that our interpreter was not able to translate into the English language.

One drawback to using word-clues to teach bird song recognition is that the device is not always used with sufficient discrimination. Teachers sometimes fall into the rut of tradition. Because John Burroughs wrote that a white-throated sparrow sang *Old Sam Peabody, Peabody, Peabody*, does not mean that all white-throats sing only this song. In fact, out of hundreds of white-throat songs, the only one we ever heard that even approached Burroughs' was a *Peeeeee body-body-body-body*, that ran downward in pitch. We had one white-throat in our Dallas back yard in winter who sang *the music goes round and round*—well, almost like that. Many warblers have at least two characteristic song patterns. Sometimes a black-throated green sounds like *trees, trees, murmuring trees*, and at other times like *see-me see-me see-me Suzy*. These two songs do not sound alike. Of course, another drawback to this teaching device or "game" is that listeners' ears and imaginations differ.



Jerry Stillwell poses in his Ozark backyard to show the new recorder. The recorder usually stays indoors, with microphone wire running to favorite singing perches of the birds of the brushy Stillwell acres.

Perhaps our most thrilling recording success was our first hermit thrush. We began trying to find them in 1949, but those charming birds in The Valley delayed us, and it was past singing season when we reached northern Michigan. In 1950, we got no farther north than Louisville, Kentucky, where we were all summer acquiring several kinds of new recording equipment. It was 1953 when we again set the hermit thrush as our ultimate goal. This time we started north so early—always trying to stretch the recording season—that we were caught in a "dogwood winter" in Kentucky, in late April. A Louisiana waterthrush teetered around the sleet-covered terrace in front of our cabin in Otter Creek Park, thirty miles from Louisville. We sat indoors and watched the barges on the Ohio River, or drifted over to the park director's home to talk about the good times we had while they were our hosts for the entire summer of 1950. The director and his wife still laugh about seeing Jerry dash out of the trailer, clad only in his undershorts, the first night we were there. A whippoorwill had begun to call from a shed roof, a few feet away. How could we know that the bird would come back to that same spot night after night?

It was in the Poconos region of Pennsylvania that we finally found our singer. Owners of a beautiful hemlock forest were horrified when we said we would like to "get" their hermit thrush. It was the beginning of a beautiful friendship, however, when we explained that we merely wanted to record a bird song on tape.

Deep in the forest that evening we found our bird. When Jerry finally signaled Norma for an announcement, after the bird had been recorded to our hearts' content, her voice trembled with tears. "H-hermit thrush, Wagner Woods, Poconos Lake, June 'teenth." Jerry saved that announcement in our (continued on page 444)



This is not a cluster of tiny sponges, but the fruiting bodies of a pretty, reddish-brown slime mold known as *Arcyria*, sponge-like in appearance and texture.

←

Packed with a brown dust composed of millions of minute spores, and looking like miniature puff-balls, the structures of the slime mold, *Lycogola*, below, are in the "plant" phase.

Have You Ever Seen a Plant-Animal?

By HAROLD V. GREEN

Photographs by the Author



MOST PEOPLE have little difficulty in separating plants from animals. However, there exist, on this amazing old earth of ours, certain "things" that have kept scientists guessing and wrangling for many, many decades. Zoologists, at times, claim them for their own, and call them *mycetozoa*. Botanists, too, sometimes claim them, and they call them *myxomycetes*. In common parlance, they are known by the not-too-pretty name of slime molds.

And small wonder it is that these weird "things" have caused so much confusion and debate, for they sometimes behave like animals and, at other times, like plants. During the animal phase they creep, stream or ooze forward like gigantic amoebas; and in the plant phase they look, for all the world, like miniature fungus. Sometimes they creep about searching for bacteria, microscopic protozoans or bits of plant tissue to eat; and then overnight they may change into tiny, spore-filled plants. In other words, if you find one of these "things" today, you may have to call it an animal. Examine it tomorrow, and you may have to do an about-face, and call it a plant. If you were asked whether one of these peculiar "things" is animal, vegetable, or mineral, probably the simplest correct answer would be, "It is not mineral."

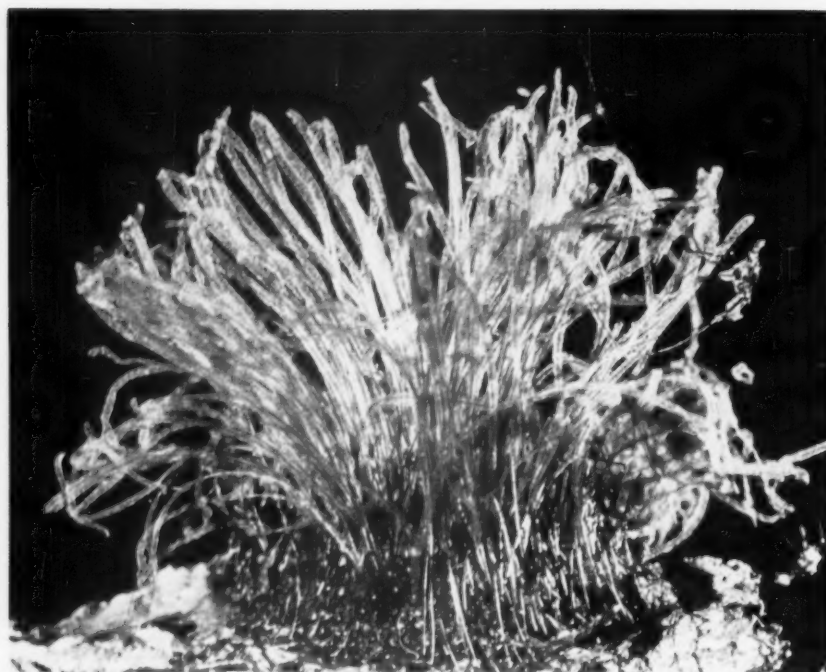
Slime molds are rather secretive in their habits, and are found inhabiting dark, damp woodland areas throughout the world. Here they creep about on or

under the bark of trees, fallen leaves or other forest-floor debris. Some species even ooze into decaying logs, where they ingest tiny particles of the moldering tree. These particles, consisting of complex carbohydrate material (cellulose), are broken down, within their naked, protoplasmic bodies, into simpler sugars, which they use as food. Other species live in the moist forest soil, but usually they come up out of the ground, when about to enter the plant-like phase. Some 318 species of slime molds are known to occur, worldwide, and of these not less than 285 different kinds are to be found in North America. To date, very few of the species have had their complete life histories worked out.

In the creeping, amoeboid stage the flowing gelatinous network or blob of substance, consisting of naked, multinucleated masses of protoplasm, is known as plasmodium. This primitive, yet, from a behavior standpoint, complex mass of streaming protoplasm is composed of thousands of amoebas that have banded together to behave like one large "community animal." In turn, these amoebas come from minute spores that have been shed by slime molds in the fruiting stage. Just what mysterious impulse prompts these thousands of amoebas to start clustering together, to form one large foraging organism, is one of Nature's best kept secrets.

For hours, days, or even longer periods of time, this large amoeboid creature creeps about searching for food.

Shown here are the sporangia of a slime mold, *Stemonitis*. At this stage, these feather-like structures are of a deep, dusty blackish-violet color.



Then, obeying some secret impulse, it creeps out of the dark, damp places it inhabits, seeks the bright, dry places, comes to rest, and inexplicably gathers itself together in what has been called a "schmoolike blob." It then begins to transform itself into a cluster of tiny, spore-filled plants.

These little plants, with their spore-packed fruiting bodies, often are exquisite in form and color. They look like minute lollipops, toadstools, tiaras, egg-cups, bowler's bats, pincushions complete with pins, and so on. In color they may be brown, yellow, orange, pink, red, black or white. It is at this colorful stage that the amoeboid-plant comes to the end of its cycle.

After a period of quiescence, the spore-chambers burst, releasing a dust composed of thousands of life-bearing spores. When these spores reach moist earth they

unlike the spores of ordinary molds, which commence life by sending out growing germ-tubes—burst open and release tiny mobile creatures. These are colorless specks of protoplasm, possessing minute thread-like tails. Aided by the vibrating flagella the microscopic animals swim along through the water-film on the surface of soil, leaves or bark, looking for food.

After a time spent as swimming creatures, they absorb their whipping tail-like appendages and become extremely small amoebas, that multiply, time and time again, by a process of division! Then many of these creatures fuse together again to form a blob of creeping plasmodium, a slime mold, a "thing" that is both plant and animal, a little known organism about which both zoologists and botanists have much to learn—in short, a mysterious plant-animal.



BEFORE THE HUNTING SEASON

*Now while the only scarlet in this wood
Is maple, I go strolling through the fall.
The acrobatic squirrels are leaping all
Around me in their hardwood neighborhood—
From towering oaks to the not quite so tall
Beeches and thence to maples bright as blood.*

*It's a brief red. Wild rains will bleach it brown.
Some harsher morning hunters, strolling here,
Will watch the acrobats come redly down
In the last scarlet shower of the year.*

John Nixon, Jr.

The Life of a Woolly Bear

By IDA SMITH

Photographs by the Author

EARLY one October morning, I discovered a beautiful moth in a jar on our porch. Poor *Estigmene acrea*, weighed down, perhaps, by her Latin name and a poorly developed sense of direction, was unable to make her escape. But, on the side of the jar, she had defiantly deposited eighty-three tiny, round, cream-colored eggs. I released the moth, and took the jar into my study. These were the eggs of one of the woolly bear caterpillars, usually called the salt marsh caterpillar. Six days later, I found the jar crawling with minute, black "ants." I thought, "My *acrea* caterpillars have all been eaten up!" But upon scanning the jar with a magnifying glass, I discovered that the "ants" were actually the caterpillars.

With pieces of soft blotting paper, I hustled them into the jar, placed some lettuce leaves inside, and covered the jar with a thin handkerchief. There they all settled down to eat, like black lambs grazing in a meadow, and in three days they had trebled in size. They had yellowish bodies, covered with black hairs grouped in little tufts.

The mass of eggs had measured approximately a half-inch across, each way. All but one egg hatched, and all except twelve of the caterpillars ate their egg shells for their first meal. Twelve of the shells were only partly eaten.

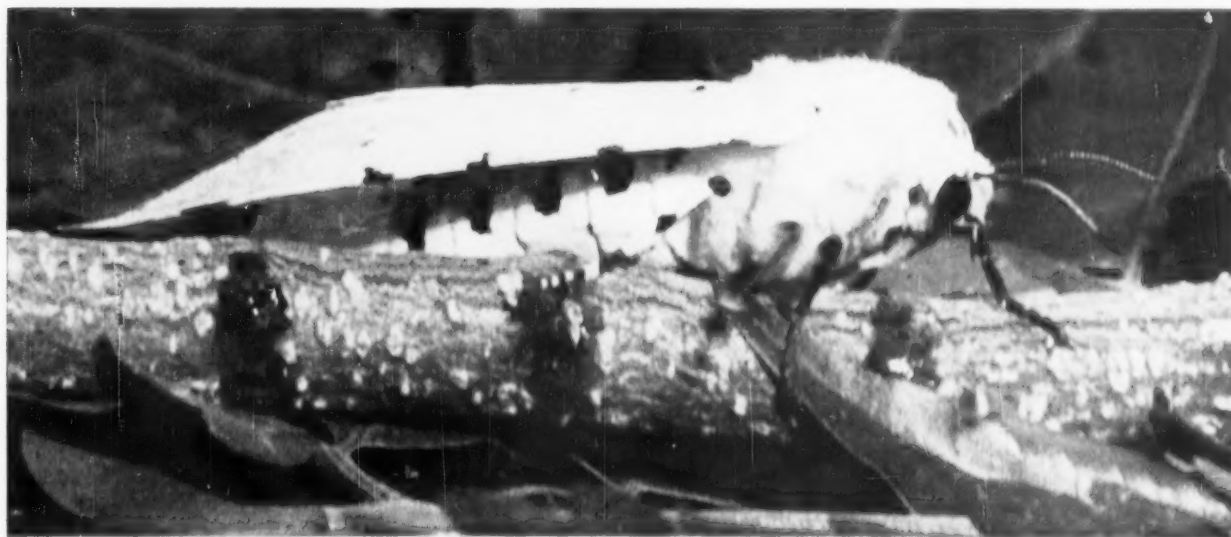
Their first noticeable molt occurred October 16,

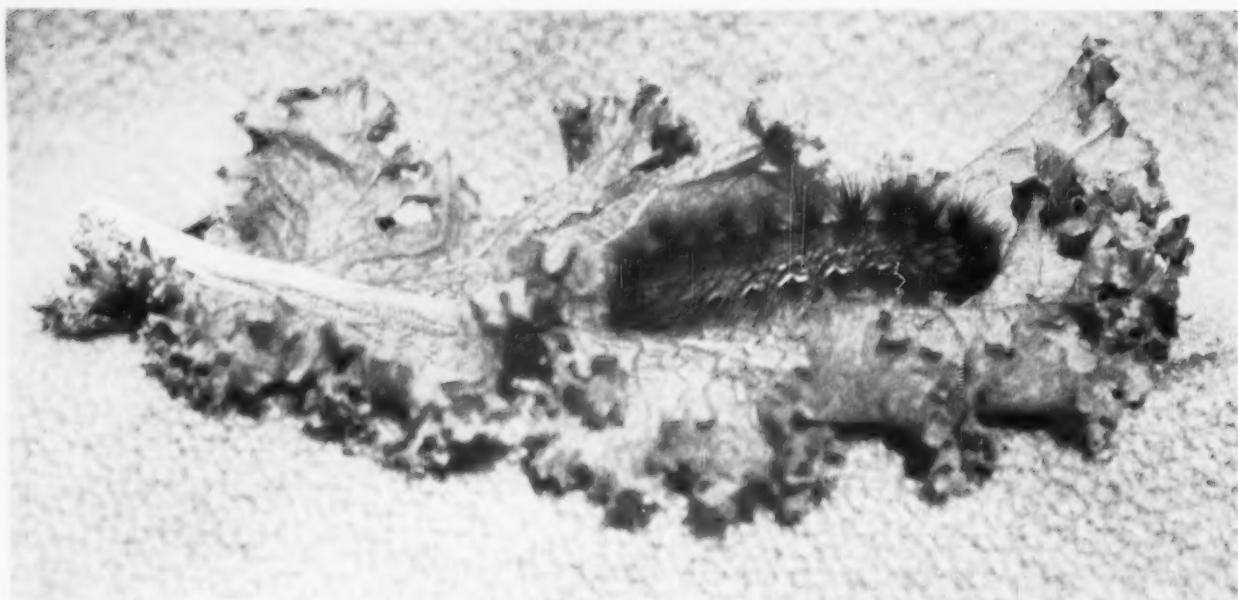


The *Estigmene acrea* moth is white with black polka-dots, with an orange saddle bordered with black dots. The wings of the female are white, both on top and underneath, while those of the male are white on top and orange underneath.

The male is the smaller of the two.

The *acrea* moth qualifies as an expert botanist, and singles out the plants that the caterpillars will need when they are hatched, even though the plants may not be in flower at the time of egg-laying.





Known as the woolly bear, the woolly caterpillar and the salt marsh caterpillar, *Estigmene acrea* is nearly immune to most insecticides, and in commercial produce fields is sometimes fenced out with little aluminum foil fences. In the fall, however, the woolly bear befriends the cotton farmer by defoliating cotton plants so that the bolls can dry out.

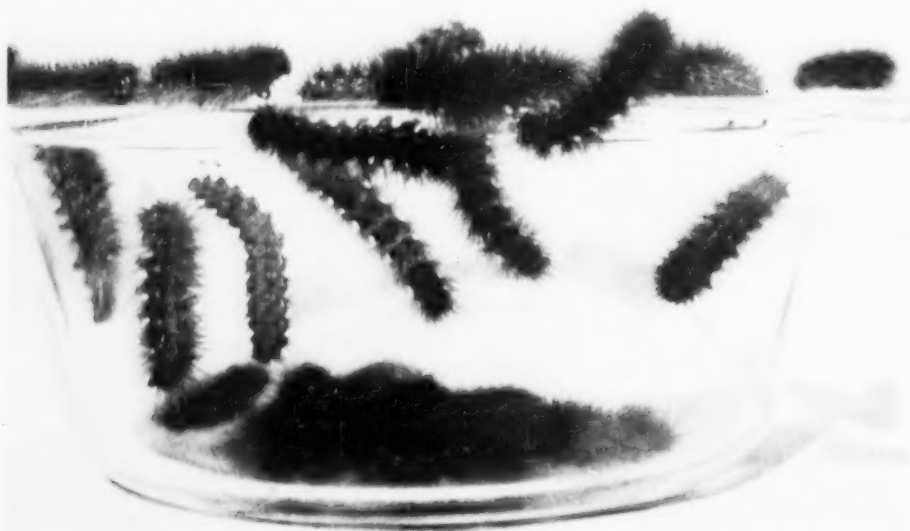
when they were seven days old, and after that they were in a continual process of shedding skins. After the first molt, their bodies were a nondescript gray-brown, but the hairs were still black. On October 21, they started eating holes in the handkerchief, and had to be transferred to a screened box. They were then about one inch long, and numbered seventy-nine healthy ones and three runts, which later died.

At each molting, they became darker on top. Their sides were yellowish with black markings, but their hairs were still black. By October 29, they were all coal-black on top, and their sides were now bright yellow, with black markings. Their top hairs remained black, while on the sides they were cinnamon-colored.

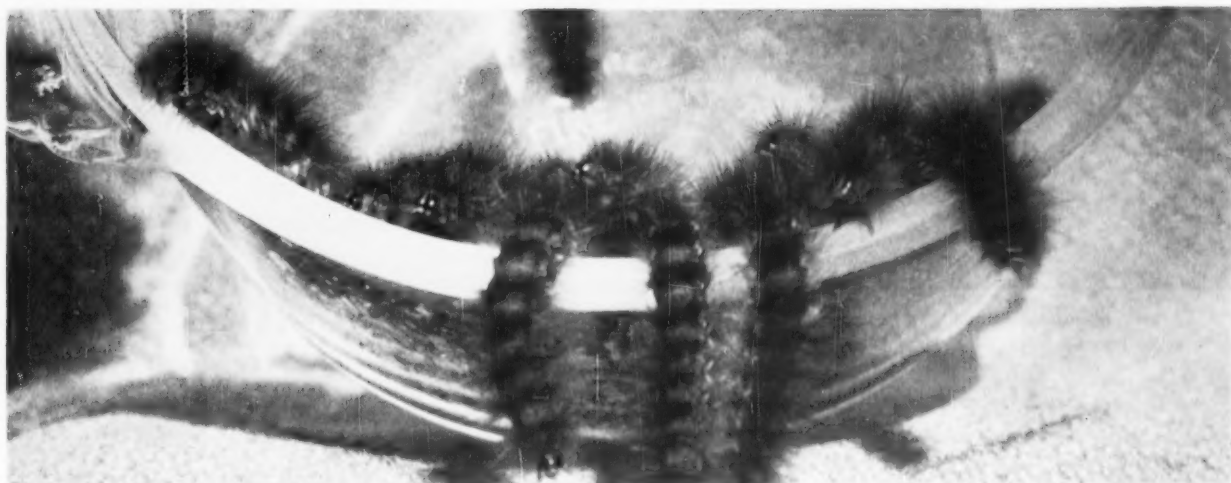
Their tiny faces looked like the faces of little, spotted skunks.

In the daytime, when I opened their cage, they would drop down from the top where they had crawled for exercise, and scurry around to get out. Feeding them and cleaning their cage in the morning was a chore. The top of the cage tipped back, and I would herd them into it while I cleaned the bottom, laid in fresh, soft leaves for bedding, and put in fresh lettuce or cabbage leaves. I found that the food had to be alternated, because they tired of one kind after a few days.

They did not fear me in the least, except to curl up and play 'possum if I picked them up. Not once did they spit, or try to bite. They tolerated me as the

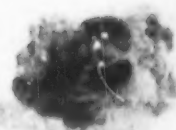
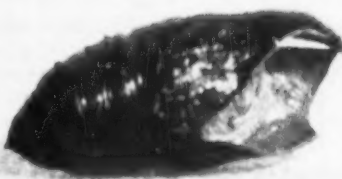


Young *acrea* caterpillars like these are the prey of several parasites, among which are two species of small flies, and three species of small wasps. Two of the wasps lay their eggs on the caterpillar, while the third lays its eggs in the eggs of the moth.



↑

The caterpillars develop cross-bands of dark blue, as they make their last color change before going into the chrysalis stage. Of the many species of woolly caterpillars of both moths and butterflies, *acreas* are most widely-known.



The skin is shed for the last time, and caterpillar becomes a chrysalis. Hidden within this shell-like covering, the creature undergoes the transformation from caterpillar to moth, a process requiring approximately two weeks, although fall chrysalids sometimes hibernate until spring. Object at right is last caterpillar skin, with the smooth black and white face still on it.

caterpillar's equivalent of a foster mother—a relationship totally inappropriate, as moths and butterflies are on their own from the moment they hatch. Their amiability was in direct contrast to the temper of a wild *acrea* caterpillar that I saw hurriedly crossing a vacant lot. I picked it up. Frantically, it spit green juice at me, and tried to bite. Except for one known species, caterpillars cannot bite or sting, as they have only soft, leaf-chewing mouth parts.

Not being a scientist, I am uncertain which insects, if any, are supposed to have "brains" and which are not, but there was certainly a distinguishing awareness in these little crawlers, regardless of whether it centered in their heads, their feet, or some other part of their anatomies. My caterpillars *knew* me.

At night, when I placed fresh food for them, I would find them stretched out like babes, asleep, some on their sides. If I moved them, they made no attempt to escape. They fed at night, as well as slept, for in the morning, the food would almost all be eaten.

They ate so ravenously that finally I had to clean their cage both morning and night, and put in clean, dry bedding. I gave them a sun-bath (continued on page 442)

Before shedding its last skin, *acrea* caterpillar spins a blanket, interwoven with some of its discarded hairs. The sides of the blanket are securely fastened to a leaf.





Chesley Bonestell's mural of a lunar crater stretches 40 feet along a wall in Boston's Museum of Science. The viewer is "standing" on the inner slope of the crater wall, 1300 feet above the crater floor, looking across to the far rim, 30 miles distant. Faraway objects are sharp and clear and the sky is jet black, due to lack of an atmosphere.

The Moon Comes to Boston

By ALDEN S. WOOD

Flanked by an inverse arch of the Milky Way, a luminous earth floats above the sere landscape of the moon. At far right is a curious lava arch and crag rearing 1000 feet high. On the crater's floor are frozen waves of lava, cracks, partly submerged craters, and peaks and cinder cones, as well as craters formed by the impact of meteors. The floor of the entire crater is coated with pumice-like dust. The daytime moon temperature runs to 215°F.; nightly, it drops to -250°F.!



EARTH'S sole satellite, the moon, is a perennial in daily conversation. People reach for it, sit under it, kiss in its silvery light, and may even claim it is made of green cheese! But it took Boston's Museum of Science and the talented brush of space theme illustrator Chesley Bonestell to bring the moon down to earth.

They did this by means of a spectacular lunar mural, forty feet long and ten feet tall, that gives the observer the feeling he is standing on the rim of a great crater and looking across its basin, which was exactly the effect Mr. Bonestell worked to create. Clever, concealed lighting, both white and blue, gives a startling dimension to the giant painting. Since there is no atmosphere on the moon, the sky appears jet black, and the stars and a "full" earth are light-limned against it in brilliant contrast. Farther out in space, halftone swatches of the Milky Way drift against the eternal darkness.

Perhaps the greatest impact comes from the stark topography of the crater floor and the jagged sweep of its far rim. With the first glance across this pock-marked plain, the observer's mind swings to a vision of blazing

meteors hurtling in from outer space, to plunge soundlessly into the lava surface, leaving the classic, ringed depression in mute self-memorial. Indeed, he suddenly realizes, too, that the mighty crater at whose edge he stands could have been formed only by some ancient celestial monolith hammering with cataclysmic force into the moon's young crust.

Chesley Bonestell, the man whose knowledge and skill created this mural, is a noted architect and astronomer, as well as an artist. He painted the mural in three sections, at his California studio. After they were shipped, and hung by the Edward K. Perry Co. of Boston, the painter came East to blend the abutting surfaces.

The mural hangs in the lobby of the soon-to-be-completed Hayden Planetarium, at the Museum of Science, and is complemented by a triad of smaller oils—the originals of Bonestell's magnificent illustrations for *Life Magazine's* "Starry Universe" article. They depict a double star, the planets in relation to the sun, and the life span of the earth, from its possible origin in a cloud of cosmic dust, to its probable dissolution when the sun dies.



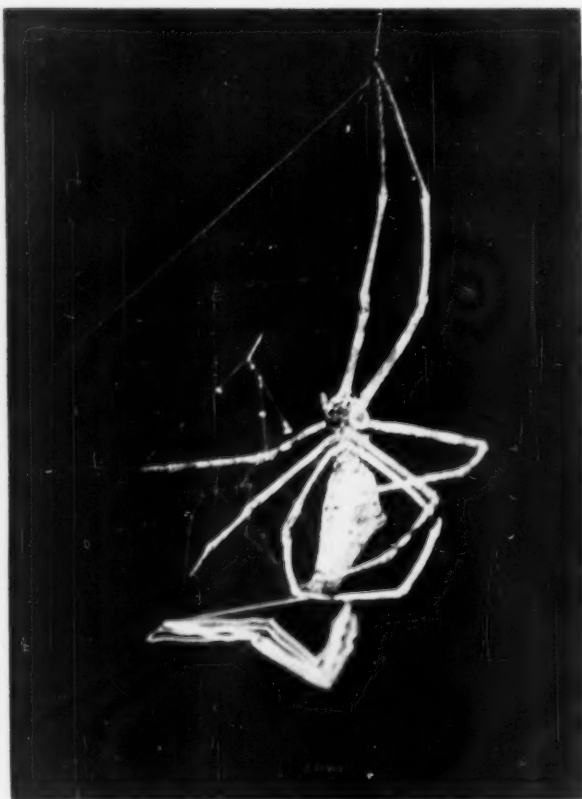
This unusual view shows earthlight, sixty times as bright as full moonlight, coming in from the right across twin 5000-foot peaks, at right center in the picture. To the left, brilliant sunlight caps a 16,000-foot mountain range on the crater wall. The bright planet just above the two central peaks is Jupiter; at the bottom left are three cinder cones near the rim of a meteor crater. Chesley Bonestell's lunar mural is as faithful and true a representation as can be created today.



Net-Making Spider

By NOEL L. ROBERTS

Photographs by the Author



A long-bodied female begins to spin her net on a silk framework. She supports herself by clinging to the guy-threads with her first pair of legs. Below, the bluish, sticky silk is combed out with the fourth pair of legs, and the threads are spun across framework. Spider looks upward, and does not see her handiwork.

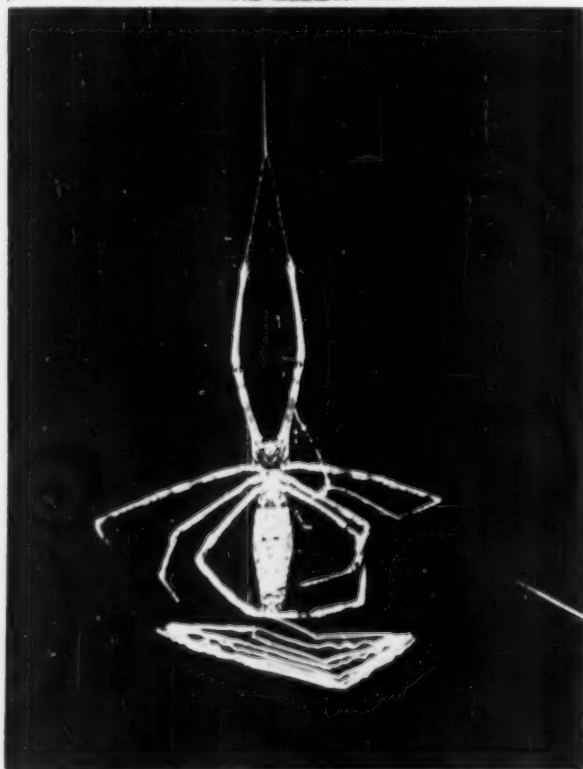
Long before primitive man had learned to increase his catch of fish with nets, the net-making spiders were casting silken snares for their meals. One of the cleverest exponents of the art of net-casting is the Australian netting spider, *Deinopus subrufus*, which can weave its efficient death-trap of some twenty strands in about half an hour. The trap varies little in size and shape, being roughly rectangular, and woven across a framework of sloping threads.

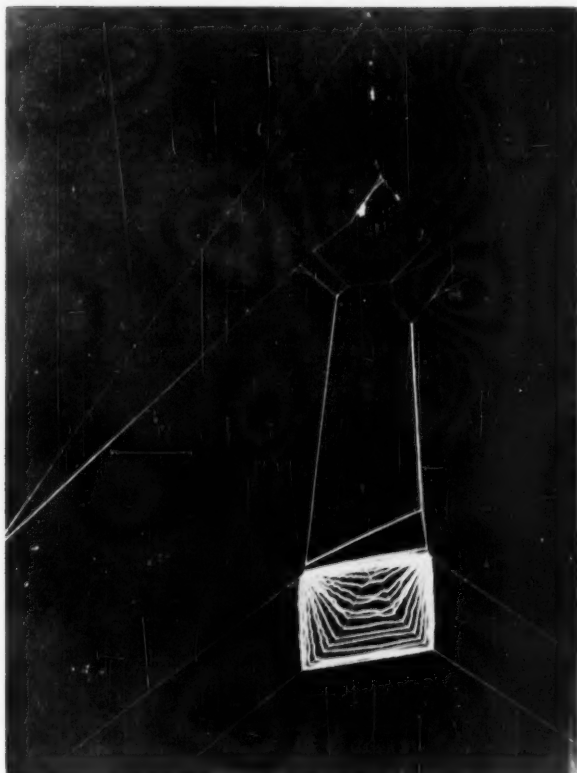
This spider never sees the net until it is finished. Staring upward into space, it shuttles a thick, adhesive silk from the spinnerets with the fourth pair of legs, and as many as three nets may be made in one night. If the net is damaged, the spider rolls it up and eats it.

Having completed a net, the spider climbs above it, approaches it head-down, and feels for the four corners with the claws of the first and second pairs of legs. Then the net is stretched with a sudden movement, and the spider waits for her prey to come within range. Lunging quickly, the spider touches an insect with the outstretched net, allowing it to tangle itself hopelessly in the sticky silk.

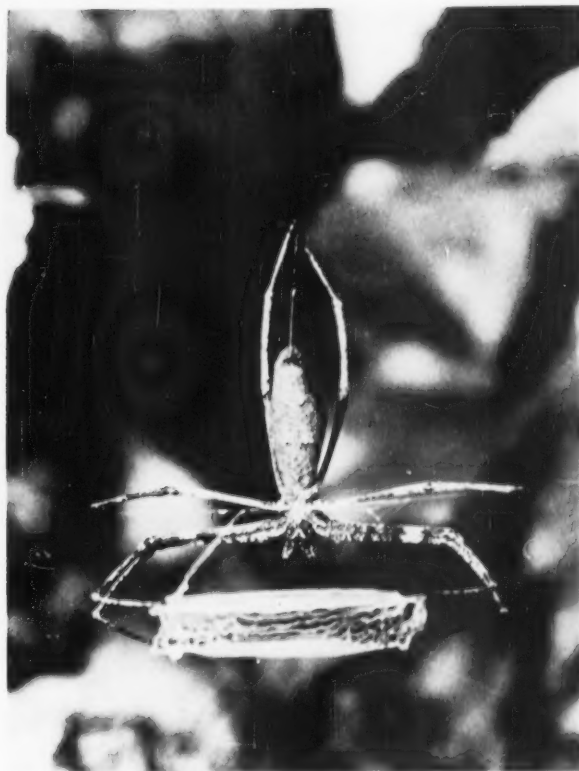


The highly efficient death-trap nears completion, the corners being tied neatly to the frame.

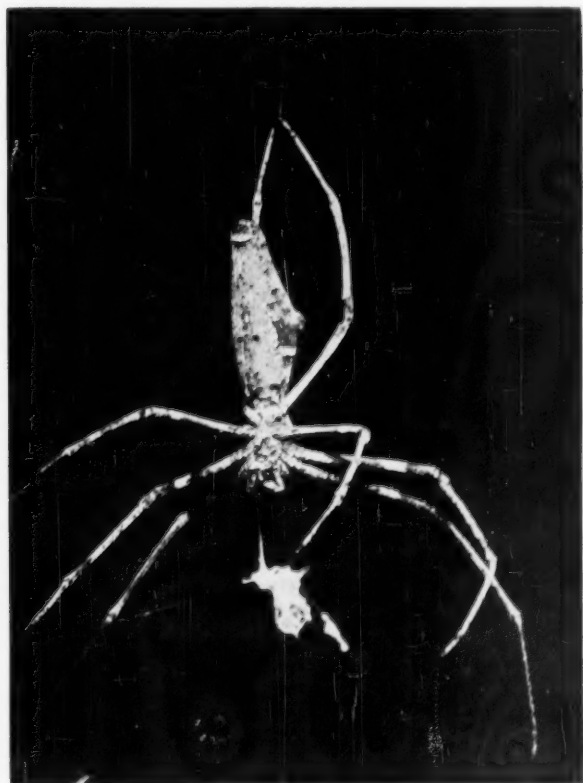




The finished net is a unique example of spider craftsmanship. In the photograph below, *Deinopus* has dropped the net on a sugar ant, which is hopelessly enmeshed. If the net is damaged during a struggle with a victim, the spider will roll it into a ball and eat it, and then go about the business of creating another trap.



Spider now reverses its position on the completed net, and feels for the corners with the first and second pairs of legs. Stretching the snare with a sudden movement, it awaits its prey. Below, a new crop of netmakers will soon become experts; the female deposits from 100 to 120 creamy white eggs in each egg-sac.





"I had taken the picture several years before, on a clear, sparkling morning after a three-day storm. . ."

Surf on the Desert

By WELDON F. HEALD

Photograph by the Author

WHEN Phyllis and I moved to Tucson, in the southern Arizona desert, I added a combination study, library and work room to the house. One wall, facing the big front picture window, we felt was just the place for a photo-mural. So I carefully went over my western negatives, putting aside possibilities, and eventually had quite a pile of pictures. There were mountain lakes backed by snowy peaks, cool forest aisles, spectacular canyons, and vast, sweeping deserts. But somehow, none of them would do. Finally, I came across a photograph of surf at Point Lobos, on the California coast. I had taken the picture several years before, on a clear, sparkling morning after a three-day storm, and have never before or since seen such a raging, explosive welter of white water. I knew immediately that this was the one picture for the vacant wall space.

A local photographer successfully blew the picture up to eight-by-ten-foot size, and I asked an artist friend to put in the blue of the California sky, the iridescent greens for the churning, foam-flecked sea, and the warm brown of the rocks. Then we put the mural on the wall, and stepped back to take a look. The effect was startling, and we involuntarily ducked. It seemed as if the whole end of the room opened on the storm-lashed Pacific, and that we would be engulfed in crashing waves and carried away in a smothering turmoil of white foam.

But it is from the street that the mural is most effective. When flood-lighted at night, it is strikingly framed in the picture window, with all the color and atmosphere of the real thing. From the very first evening the surf at Point Lobos has attracted the desert-dwelling Arizonans passing by, (continued on page 445)

Music of Autumn

By GILEAN DOUGLAS

Photograph by the Author

WHAT lovelier ending could there be for summer than the song of wings? The days of warmth and light are almost over, and now each day shows a dark feathered tide moving back and forth across the spit, while there is music in the air.

It has been almost five months since I heard that sound; that clear, sharp harmony which means that the golden-eyes are moving again. Now I can see a restless surge of black and white bodies upon the water; stretching and contracting, forming swift patterns that dissolve as quickly into lines and tangents. This restless mosaic of golden-eye, white-winged scoter, sea coot and old squaw appears to be hopelessly confused, but a second glance shows that each species is in its own group, separate and complete.

Along the borders of this congregation a loon seems to be patrolling, with many sharp glances at loose formations. Two female pied-bill grebes float gently with the tide, appearing oblivious to the sound and movement around them. Over it all that high, keening note of wings as restless golden-eyes are airborne for a few moments, and then come in for a sure, swift landing where I would swear no space existed for them to land,



"The mountains have fresh snow on them . . ."

Now the ducks are swung in a long, uneven line from the spit out into the channel. Some begin to feed and to talk a little. A segment of heavy surf scoters prepares to take off, but seems hardly able to get into the air.

The mountains have fresh snow on them since the storm, and the broadleaf maples are shedding their sunset leaves. There are still clouds, but when the sun breaks through them around noon the scarlet rose hips on the big wild bush in front of the door are startlingly beautiful against the deep blue water. Zinnias, marigolds, asters and cosmos are still tall and bright in the garden, and nothing seems to bother the nasturtiums.

But it is really autumn now and every moment of sunlight is precious. The song birds have gone except for a few year-round neighbors, and leaves rustle underfoot. Slowly the golden-eyes drift across the bar, with now and then a lilt of wing.

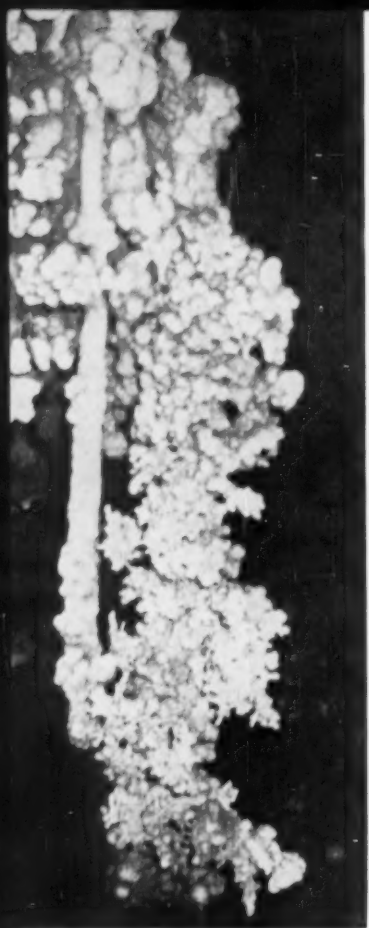


THE BLUE THAT NO ONE CAN FORGET

(Crater Lake, Oregon)

*Who ever walks up to this bluest blue
That ever decorated any sod,
Must tremble inwardly before the view,
As though they suddenly confronted God.
Long years have passed since our first meeting, yet
I often seek to find in Summer skies,
This richer blue that no one can forget,
Or trace it in my young grand-childrens' eyes.
The soft, breath-taking beauty brings to mind,
An earth torn with destructive violence
Where once, a fiery mountain left behind
This gorgeous lake—as gentle recompense.
Out from its mystic loveliness and all,
Some stilled beloved voice will clearly call.*

Edward McNamee



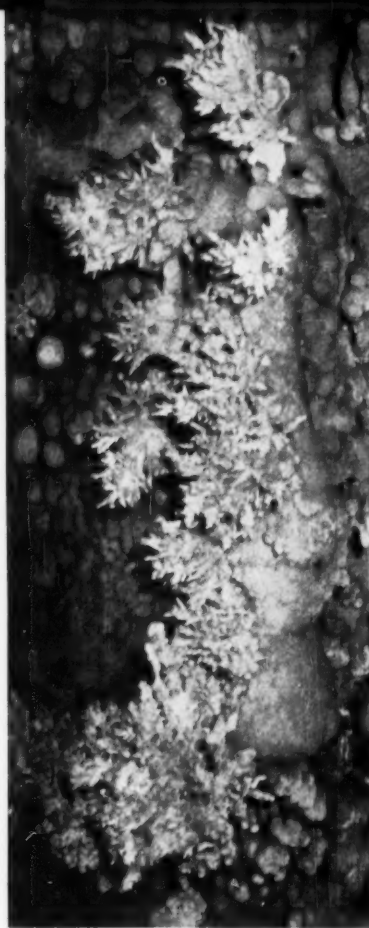
*Wonders of a cave
were revealed when*

The Bottom Fell Out of a Well

By CLAY PERRY

Hanging beside the "door" of one of the Hour Glass Cave rooms were these fantastic helectite formations.

Dick Hoffmaster recorded some of the delicate aragonite crystal formations that ornament the walls and ceiling of the cave.



ONE of the oldest known caves in West Virginia was long known as the Bishop Asbury Cave. Located near Riverton, in Pendleton County, the famous Methodist Bishop, Francis Asbury, visited the cavern in June, 1781, described it in his journals and told how music like that of a pipe organ could be made by striking the hollow stalactites and stalagmites that drape a huge formation at the very bottom and end of the cave. In more recent years this cavern, because of its shape, is usually known as the Stratosphere Balloon Cave.

This cavern is one of a group of caves in the region, and a favorite place for the explorations of the cave-going fraternity, men and women known as speleologists, or sometimes, "spelunkers." One of these devotees of the subterranean is George Chappell of Pittsfield, Massachusetts, who, as a student at West Virginia Wesleyan at Buckhannon, risked descent into some of the caves in the area in company with other similarly minded classmates.

The curiosity of this group was aroused when word came of a cave near the Asbury Cave. It was on a farm originally owned by Walter Warner, then by Ray V. Bowers of Riverton. Mr. Warner had set out to drill a well, but when he got the shaft twenty feet below the surface of his meadow, the bottom fell out of the well. Thus was opened up an unsuspected cavern forty-five feet below the bottom of the well shaft. The college speleologists went to have a look, but it was not until February, 1956, that a group of enthusiasts found the

time and the equipment to try to get into the cavern.

The only entrance was by way of the intended well, and the hole at the bottom of the shaft was only large enough for a man to get through. It was more difficult to get up and out of the cave. Two of the young men made the descent by being lowered on a stout rope, with an extra safety line fastened to their bodies. They found themselves in a hall of wonders. Their flashlights and carbide lamps revealed formations, draping the walls and ceiling and growing out of the floor, that were fantastic and unlike anything they had ever seen. Vince Colomba tried to bring back a record in the form of flashlight photographs, but the change in temperature fogged his lenses and he drew a blank. Also, cold rain had drenched and chilled them, and they were fatigued from their efforts. It was growing dark and with seventy miles to drive, they left reluctantly.

Not until June 8, 1956, could they muster a larger crew of six, and were able to return. This time they had better equipment, including a steel wire ladder, 300 feet of one-inch rope, and some smaller rope for safety lines, candles and railroad flares. Chappell and Peter Fink were chosen to go down, while four others manned the ropes and ladder. The two spent some hours in the cave, measuring it, photographing it and collecting some specimens of the varied formations that had been broken off and were on the floor.

The explorers found that the cave had two main rooms on the same level, separated by a stone wall. One room

is twenty-five feet long, fifteen feet wide and twenty-five feet to its sloping ceiling; the larger one is thirty-nine feet long, fifteen feet wide and twenty-five feet high. As the young men crawled, climbed and wriggled about they found different kinds of formations at each turn. Most remarkable among these were strangely formed helictites, dangling from the walls; gypsum flowers or oulphodites growing out of the limestone walls; large and small candle formations, botryoids, of pure white calcite. Some of the formations were of varied colors—yellow, red, blue, brown and the purest white—such as are found most numerous in Ohio caverns. There were even translucent pink helictites. Some of these were musical, too, if lightly tapped; some were so delicate they could hardly be touched without breaking, and were like hollow straws of crystal. In one room so many gypsum flowers were found that they called it the "Flower Room." In another place were ribbon helictites and, of course, numerous stalactites and stalagmites, flowstone masses, and dripstone knobs like mushrooms.

Most exciting discovery of all was a crevice in the



PHOTOGRAPHS BY RICHARD E. HOFFMASTER

Above, Ed Glatfely looks at some of the unusual stalactites in Hour Glass Cave, and, left, Dave Strunk points at some of the grape-like formations.



floor of the "Flower Room." Amid masses of stalactitic formations, this break revealed, at a lower level, another chamber. Still stranger was a chance discovery, as a flash photo was being taken, of a vein of *soft coal* in the roof or ceiling of the cave. This was an unique mixture of bituminous coal and limestone, so far as caves go.

Up to now there has been no geological examination of this cave. William E. Davies, who made a geological and speleological survey of the caverns of West Virginia, however, had explored and classified forty-eight known caves in Pendleton County, some of them clustered close to this one, which was unknown to him. The caves in

Pendleton County, Davies writes in the book *Caverns of West Virginia*, reach spectacular development of several kinds of limestones.

George Chappell is not a geology student, but has studied independently the geology of West Virginia. He says this marvelous hidden cavern seems to be coated with calcite of a rare and beautiful texture. The colors found come from both mineral and vegetable dyes that leak through from the coal roof and the ground above that.

A curious feature of the break-through of the well into the cavern is that it happened to penetrate a natural jug-shaped entrance, best described by Richard Hoffmaster, of the Pittsburgh Grotto of the National Speleological Society, as an hour-glass. So the cave has been named Hour Glass Cave. Mr. Hoffmaster is one of the few spelunkers who have gotten into the cave. The small hole in the well shaft bottom almost blocked Chappell from getting out. The hole is in solid rock. Mr. Warner had attempted to enlarge it with pick and shovel but found it impossible. After the original owner's death, Mr. Bowers boarded the shaft over with planks and beams, to keep children and animals from falling into it. In another cave, on property owned by the Warners, a calf fell into a small shaft and twenty-five feet down to a pile of rocks with stalagmites thrusting up through the heap, and was killed. This one,



Connie Jo Kercher was recorder of the cave trips, along with Georgetta Elaine Decker. At the right, spelunkers Richard Von Hoorn, Ed Powers, Jerry Tell, George Chappell, Al Foss and Pete Fink, all of West Virginia Wesleyan.



called Broken Dome Cave, has some of the features of Hour-Glass Cave, but not its white calcite formations.

The adventures of the Wesleyan crew were somewhat painful at times. On their June expedition, Chappell was being hauled up when a cloudburst came and he was left hanging just below the wellhole, as his crew lashed the rope to a tree and ran for shelter. George got some of that cloudburst. At the same time, the smoke from railroad flares he had dropped through the crack in the Flower Room rose all about him and almost choked him. When the hauling job was resumed he was banged against the rock that rimmed the hole, his helmet falling off and striking Richard Von Hoorn, who was still below. Finally Jerry Tell of the ground crew climbed down the wire ladder, which had been lowered as far as the hole, and literally jerked George up through.

There have been some tragic and near tragic experiences in the caverns of Pendleton County. An amateur spelunker, who had never done any "mountain climbing underground" fell to his death in huge, deep Schoolhouse Cave when he trusted to an old rope that he found in the cave. Two young men, from Washington, D. C., entered the extensive Trout Cave in Franklin with a single flashlight and some paper matches. Their flashlight failed, they used all their matches and huddled on a ledge, afraid to move, for three nights and part of three days. They were rescued only by the persistent efforts of a newspaper editor of Franklin, whose "nose

for news" inspired him to stimulate a continued search after others had abandoned it as useless or hopeless.

There are dangers in spelunking, but this hobby is not as fearsome as is popularly believed. The rewards are the discovery of parts of the last frontier on—or in—this earth; thrilling beauties; dead silences; complete darkness; fauna and flora unlike anything found on the earth's surface. Nature, working in the dark, fashions things as if secrecy and silence were necessary for these subterranean sculptures and pictures. Members of the young but growing National Speleological Society, which was organized in 1940, have gone a long way toward revealing what lies buried and hidden in the earth. They have also learned a great deal about the sciences, as well as having sport. Even as this is being written, the group from Wesleyan College are planning to revisit Hour Glass Cave to see if they can dig their way into the lower chamber. It may be more beautiful than the others they have seen.

The students who participated in the expeditions of February and June, 1955, have the true spirit of the explorer. They are, besides George Chappell, Vincent "Columbus" Colomba, Jerry Tell, James Lockhart, Gerald H. Russin, Richard Von Hoorn, Peter Fink, Al Foss and Ed Powers. Richard Hoffmaster of Pittsburg, with Ed Glotfelty, are two others who went in while camping at nearby Schoolhouse Cave to take movies in color of that great cavern.



OCTOBER

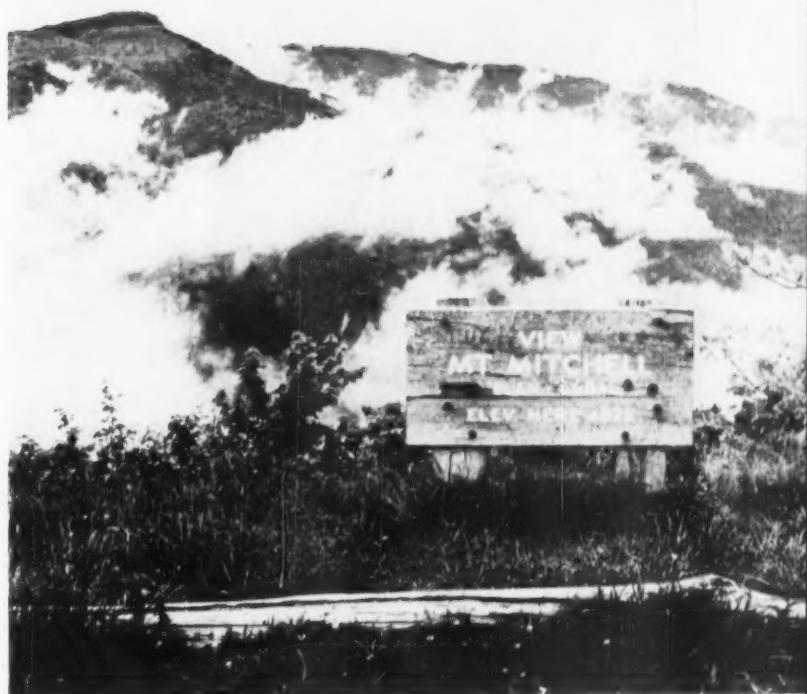
*This is the golden season when
October bellows up earth's fire,
And with a skill unknown to men
Makes fabulous gems for tree and briar.
Now with the hammer of the wind —
He will have none of cruder tools,*

*He pounds out leafy tinkets, thinned,
And bright as Revelation's jewels;
In precious bronzes and enamel,
In silver filigree and gold,
He forges sunlight-nets to trammel
More beauty than one heart can hold.
Marion Doyle*



Elisha Mitchell
1793-1857

Mt. Mitchell, which finally claimed the life of Elisha Mitchell, pioneer American geologist and explorer, soars above the Blue Ridge Parkway in North Carolina.



N.C. DEPT. CON. & DEV.

The Mystery of Elisha Mitchell

By ANN and MYRON SUTTON

EVER since the first Eolithic cave-man crawled to a ridge-top and surveyed the terrain below, man has inexorably pushed his land frontier higher and higher. From that first primitive cliff-climb to the ultimate capping of Everest, there has been something about a mountain—and there still is—that lures men to it, in spite of weather, hazards, or a wild and trackless terrain that girds a mountain's lower slopes.

Whatever that something is, North Carolina's Black Mountains have always had it. And whatever there is about a man that drives him again and again to a mountain—to reach, to explore, to master—Elisha Mitchell had that.

But no man, not even the most sagacious mountaineer, will ever know what happened on that fateful day in June, a hundred years ago, when Elisha Mitchell's mountain mastered him. It is today one of the dramatic mysteries of American mountaineering.

Yankee-born and Yankee-schooled, Elisha Mitchell came to North Carolina's frontier country in 1815 with the trappings and makings of greatness. These he got partly by inheritance. His father was a farmer, his

mother a fourth-generation descendant of John Eliot, the 17th-century Puritan clergyman who brought Christianity to Massachusetts Indians in their own language, and became known as "The Apostle to the Indians."

Geology, the science of the earth, was Elisha Mitchell's love. That was in the days when oil came from whales, and before anyone had tapped even the first fantastic capabilities of uranium.

At the University of North Carolina, Mitchell established a reputation for exceptional energy. He made frequent scientific trips around Chapel Hill itself and later expanded his explorations to other parts of the State.

Before long he had become known to both city folk and frontiersmen in practically every corner of North Carolina. In turn, he knew the State, its people, its birds, mammals, insects, fish, trees, flowers, mosses, rocks and sands. Said one of his admiring co-workers: "In the discharge of his duties he exhibited an energy, a vigilance, an intelligence, a good common sense, a self-denial, an attention to minute particulars, and a



PHOTOGRAPH BY LOU HARSHAW

From the stone observation tower atop Mt. Mitchell, the modern traveler may share with Elisha Mitchell the thrill of the panorama of southern highlands.

A spruce-fir forest typical of Canada covers the upper slopes of Mt. Mitchell, while oaks, maples, gums and tulip trees crowd into an almost impenetrable mass in the lower valleys.

success rarely surpassed, or even equalled."

In 1822, the North Carolina General Assembly appropriated \$250 a year for a Geological and Agricultural Survey, which Mitchell helped organize. It was little more than a geologic reconnaissance of North Carolina, but, however primitive, it constituted the first State geological survey.

After the panic of 1825, the Assembly withdrew support of the survey and it soon languished. But Mitchell, with a scholar's disdain for accepting any fact or knowledge second-hand, searched out a tremendous store of North Carolina knowledge, too little of which was published. Upon his classes at the University he lavished the meticulous details he had learned for himself, although he was quick to confess the limitations of his science, and made no pretense of knowing the whole geological story of North Carolina, much less that of the world.

The more he travelled through North Carolina, the farther Mitchell's fame and eminence spread. About 1830, news was brought to him of a ridge in the western part of the State that quite possibly measured higher than any other peak in the eastern United States. Nothing could have better fueled the flame of Mitchell's curiosity. He vowed to find the mountain, and measure it himself.

In 1835, he led an excursion into the then deep wilder-

ness country of western North Carolina—a wild and tortuous terrain with few if any trails, and inhabited by animals and reptiles that had not yet known the tread of man.

On July 27—a serene and clear day—Mitchell made his first observation of the mountain that was to bear his name. Surveying the horizon carefully, he noted the configurations of the skyline in his journal:

"Top of Yeates's knob; N.E. knob of Black bore N 46 $\frac{3}{4}$ E. Counting from Young's knob: one low one; one low one; two in one, the southernmost pointed; a round knob, same height; a double knob, then the highest; then a long low place with a knob in it; then a round three-knobby knob, equal to the highest, after which the ridge descends."

That was only the beginning. The description, which



tallies with a range profile drawn by Princeton's Professor Arnold Guyot from the same point twenty years later, marks history's first recognition of the significance of Mount Mitchell.

The next day, the party made its way to the ridge summit, where Mitchell climbed the tallest fir he could find and took observations. "After consulting his barometer," a guide recalled, "he said that it was the highest point that he had found yet." But he was not sure. He returned in 1838, and again in 1844. About that time, one Thomas Clingman, of North Carolina, put forth a claim to having been the first to measure the culminating point of the Black Mountains.

Clingman was no mean claimant. A Congressman (later Senator and Confederate Brigadier-General), he had graduated from the University of North Carolina and often explored the lofty peaks of the Appalachians.

It seemed clear that Clingman had measured the highest peak all right, but the question was whether he had measured it before or after Dr. Mitchell. Clingman was convinced that Mitchell had been mistaken in the mountain he measured. For a while the highest peak was called Clingman's Peak, and Mitchell's name was transferred to the summit he had noted in his diary earlier as the "round three-knobby knob, equal to the highest."

Obtaining the finest instruments available, Mitchell climbed the mountain in 1856 and again in 1857, intent on settling the controversy once and for all, as well as to correct some of the errors of his earlier visits and compare indications of the spirit level and barometer.

On June 27, 1857, after having completed about two weeks of work, Mitchell told his son that he was going across the mountain to a settlement on the Caney River,



intending to visit several of his previous guides. He promised to return the following Monday at noon, and, so saying, departed, alone, for the other side of the mountain. When the following Monday came, the son duly arrived at the meeting-place and began the long wait for his father. No father came.

Tuesday arrived, and there was still no sign of the Doctor. The son became uneasy, but there were still so many ways in which the elder Mitchell could have been delayed that the boy did not yet consider spreading an alarm.

Wednesday came, and still no word. On Thursday morning, the son's anxiety had so increased, that with a friend he set out for the Caney River country to see what had happened. Arriving at "Big Tom" Wilson's house, they were dismayed to discover that Mitchell had not been there at all. With that, the alarm was sounded.



N.C. DEPT. CON. & DEV.

Pleasant mountain paths wind through the thick forest of red spruce and Fraser's fir that covers the upper reaches of the mountain.

A hundred years ago, citizens from Asheville and surrounding mountain villages fanned out across the rugged Black Mountains in a search for Elisha Mitchell.

PHOTOGRAPH BY LOUI HARSHAW

Before nightfall on Friday, hardy mountaineers from the North Fork of the Swannanoa were on their way up the mountain. Eighteen persons camped that night at the Mountain House, where Mitchell had scheduled his return rendezvous with his son, and other searchers began to arrive from the surrounding mountain country. As the search intensified, more and more inhabitants of the region dropped their tools and headed toward the mountain. Rain had been pouring steadily, and the mountain air was chill. Heavy clouds wrapped the ridge in thick fog, hampering search operations.

On Saturday morning the lead party, composed of many an experienced hunter, left the Mountain House and struck out for the top of the mountain. Scattering into smaller parties, they scoured the woods on the Caney River side of the ridge, but by sundown had not even turned up a trace of Mitchell's passage.

Meanwhile, another group to the rear of the advance party followed Mitchell's expressed intention of striking a bee-line from the mountain-top toward the Caney River settlements. This was a natural-enough plan, except that it avoided the blazed trail down to the settlements and traversed some rugged and dangerous country.

Watching for signs along this route, the party came

The most extensive stand of native rhododendron in the country blankets the Craggy Mountains, near Mt. Mitchell, proving most troublesome in the search for the missing geologist-explorer.

PHOTOGRAPH BY LOU HARSHAW



across a trail in soft moss and fern, and promptly followed it until it came to the first fork of the Caney. Then there was nothing. The party turned downstream, assuming that Mitchell had followed the creek-bed, possibly to prevent becoming lost in the event darkness had overtaken him.

Over rough ground, the party followed the creek for several miles, when darkness came and they sprawled beside the stream, exhausted, to wait until morning. Other parties on the mountain returned either to the Caney River settlements or to the Mountain House, weary, saddened, disappointed.

By Sunday morning the number of searchers had been swelled with constant arrivals from the settlements below. The party camping in the Mountain House set off again in the thick fir and spruce woods, and worked their way slowly through the deep gorges that reached far down into the wilds of the Caney River.

All over the mountain, a sizable population of Yancey and Buncombe counties set out to look for Mitchell, searching through rhododendron and laurel thickets, stunted birch and beech forests, and steep spruce-fir slopes of the high elevations. They covered the springs, streams, balds and craggy precipices of the uplands of the Blacks, but still there was no word.

The rain continued to pour. Thick cloudbanks scudded low across the mountain. Again search parties spread out through the forest, only to return by mid-afternoon, with not a sign of the Doctor's trail. Other parties came in, with the same result.

The Caney River group, which had followed what they were sure was Mitchell's trail, and had slung themselves alongside the stream to rest until morning, had picked up no further trace of the scientist's footsteps. They too returned.

Next day the search grew more intense. New routes were laid out and new areas designated, but again by evening no news had come in. The situation was rapidly becoming desperate. By this time the alarm had spread so far that people were flocking in from Asheville and neighboring communities to help in the search.

Little hope remained that Mitchell was still alive, but if he had not been eaten by some mountain beast or his remains otherwise obliterated, there might still be a chance of finding him. It had been two weeks since he was last seen.

On Tuesday a company of Buncombe men separated into three squads and set out again. "Big Tom" Wilson and his Caney River neighbors decided to strike

off for a more distant route, across the highest peak and down the Cat-tail fork of the river. Wilson had led Mitchell up that route in 1844, and figured he might have gone down the same way this time.

Immediately they ran into footprints in the soft turf. Tracing the trail for a short distance they concluded that they were at last on the right track. A runner was dispatched to inform the Buncombe men and tell them to hurry as fast as they could. A blast of a horn and the firing of guns from a mountain peak announced to other searchers that a discovery had been made.

The trail was followed rapidly down the mountain-side. After reaching the stream the mountain men followed along it a hundred yards until they came to a rushing cataract. There they saw footprints trying to climb around the edge of a cliff, then the moss torn and hanging—then nothing.

Clambering down the steep slope, they came upon Mitchell's body lying in a pool at the base of the falls. Marks on the bank showed that he had slipped about 45 feet down the slope, then fallen fifteen feet into the pool. Exactly what happened, or how, nobody knows. The secret lies still on the mountain.

Mitchell was interred first in Asheville, then later removed to the summit of the mountain which he had given his life to investigate. In 1888 a pyramidal monument of white bronze was erected over the grave under the direction of the University of North Carolina.

Shortly after Mitchell's death, Princeton's Dr. Guyot set the mountain controversy in perspective. He said that if Mitchell's name were to be permanently applied to the highest peak "it should not be on the ground that he first made known its true elevation, which he *never* did, nor himself ever *claimed* to have done; for the true height was not known before my measurement of 1854. . . Nor should it be on the ground of his having first visited it (though probably he did). . . nor, at last, should it be because that peak was. . . thus named long before. . . Dr. Mitchell has (Continued on page 442)

Hemlock, the Late-Comer

By RUTH H. DUDLEY

Photograph by United States Forest Service

AMONG THE members of the conifer family, you might think of the hemlock as a "late-comer." Not, perhaps, in the sense of time, for the hemlock traces its lineage far back into the geological past. But hemlock seedlings need more than the ordinary amount of protection and shade; so they wait until other forest trees have pioneered an area before they put in their appearance. When the pioneer trees have made a forest too dense for their own seedlings to grow, the late-comer hemlock moves in.

It is a slow-growing tree, biding its time, perhaps, until the trees that built up the original forest have died away. The hemlock then takes over, able to grow and multiply under conditions that exclude almost all other trees but the beech, which is often found associated with the hemlock in its stands.

A young hemlock tree is indeed a handsome sight, with its thick, feathery-foliaged branches lifting gracefully in the breeze. Its wide-spread lower branches often sweep the ground, and the tall leader branch at the top bows and nods as though bidding you welcome. In the thick hemlock forests the old trees lose their lower branches, and the dark reddish-brown trunk stretches up tall and stately. Two States have chosen the hemlock as a symbolic tree; the people of Pennsylvania selected the eastern hemlock, and those of Washington the western variety.

A true mountain tree, the eastern hemlock, *Tsuga canadensis*, likes the stormy high spots in the southern part of its range. You will find it growing in all the northeastern States, and throughout the Midwest, from Minnesota to the Carolinas, and northward into Canada. Our Indians used the tannin in the hemlock bark for medicine, and the early pioneers used it in tanning leather. Today, the wood of the eastern hemlock is widely used in making boxes, framing-

The slow-growing hemlock thrives under conditions of shade and moisture that few other trees find to their liking. When the original forest has become too dense to perpetuate itself, hemlock, the late-comer, takes over.

timbers, crates and for paper pulp.

The handsome western hemlock, *Tsuga heterophylla*, is taller than its eastern cousin. It is found in the northern Rocky Mountain area from the Canadian border to Alaska, and south into Idaho and Montana, as well as in a small fog-belt section along the coast of northern California. It likes plenty of moisture and rain, and a rather mild climate.

For many years the wood of this tree was considered unimportant. Then it was discovered that it made fine flooring, furniture, paneling and paper pulp. More recently, wood of the western hemlock has been found to have just the right qualities needed for making rayon, cellophane, and plastics of all kinds, so that many of the articles we now wear and use every day are the products of this tree.

Certainly our hemlocks are important commercially. But most people know and love them for their dark, decorative beauty. They are popular trees with our artists and photographers, and many a lawn and driveway is enhanced with the grace of the hemlock.

In growing the common eastern hemlock for ornamental or shade purposes, it should be recalled that the tree does not take kindly to poorly-drained soils. In the words of the gardener, it resents "wet feet." Also, although the hemlock

is highly resistant to cold weather, it will show signs of "burn" if it is exposed to the full sweep of cold, drying winds. Lawn-grown hemlocks, adequately protected, will retain their lower branches almost to ground level, and are great favorites with the landscape gardener, who employs them also as trimmed shrubs for his hedges.



Nature's Railway

By GEORGE WM. CORNWELL

Photograph by the Author

THROUGH the tiny, southwestern Michigan hamlet where I live runs one of those symbols of progressive civilization—a railway. From the middle of the flattened ridge of crushed limestone that forms the roadbed, the ribbon of steel seems to unroll east and west into infinity. It offers, you would think, an ideal highway, not only for railroad customers, but for an occasional pedestrian as well. But, in fact, I seem to be the only member of my species to take advantage of the railway as a footpath.

Through the seasons, my steel ribbon has wrapped a magnificent gift. It is a gift that grants the right to walk across the land; to stop and watch a hawk circle overhead; to kneel and delight in the beauty of a wild aster, the very flower owing its being to the undisturbed nature of the sodded railway cut; or to thrill at each leap of the cottontail as he hurries from his hiding place, jumping and bounding through the sumac thicket. These pleasures, and many others, are treasured by outdoor folk, and are often difficult to come by in our heavily populated part of the State. Land owners, more and more, resent trespass. Even if the full run of the fields were allowed, the practice of clean farming has eliminated extensive, undisturbed, natural areas. Furthermore, every two-acre field is bounded by a four-strand, barbed-wire fence. Such fences, in their entirety, provide formidable resistance to anyone's passing. Not so the one-hundred foot railway right-of-way down which I travel. Here is a path that can be followed for hours without a single fence to cross, without one angry farmer chasing you off his land, without the naked look of field after field under cultivation, but with a great many of Nature's crafts to attract your attention. Here, indeed, is a sanctuary that provides a place to study natural history for any one who cares to make use of it.

Each morning, about an hour before my students enter my biology classroom for another school day, I



Along the railroad right-of-way, there are no barbed-wire fences to cross, and no angry farmers to order you from the property.

start off down my path. Perhaps, one day, I will count the nests exposed in the bordering thickets of sumac and sassafras, their winter-bare branches pointing toward the warming spring sun. Twenty nests in a mile is not an unusual count. Each one of these asks the tantalizing question: Who was the architect and dweller? The yellow warbler, goldfinch, robin, crow, catbird, mourning dove, song sparrow, and many other friends find favorable building sites in the dense thickets, bordered by grass on one side and crop land on the other.

Another morning may be spent in looking for, and observing the local bird population itself. Because of the interspersed environments—cropland, grassland, woody fence row, woodlot, and swamp—the number and variety of resident birds is great. One late spring morning bird-count

may yield as high as sixty species, on an hour-long walk.

Then, too, an occasional animal is destroyed by one of the other regular travelers of the route, the Diesel-powered train. The remains, when removed to one side, provide an excellent opportunity to study the scavengers of the wild community, and to note how rapidly the carcass is reduced to scattered bones by the animal kingdom, from ant to fox. Finally, even the bones usually disappear into some nearby den.

On yet another occasion, small mammal traps provided a means of making an interesting study. The many tunnels in the grass-topped sod, as well as tiny tracks in the snow, were indicative of a large population of small mammals. The traps, set one day with peanut butter and bacon baits, and visited on the following morning, yielded a short-tailed shrew, a prairie deer mouse, a meadow mouse, and a red-backed vole. Later study and autopsy helped to establish weights, measurements, sex, breeding condition, identification, and practice in the use of a mammal key.

The number of study topics along my Nature path

is limited only by the observer's vision. Seeds, flowers, water plants, woody plants, leaves, insects, ecological succession, fossils in the crushed stone roadbed, all provide countless opportunities to observe the daily and seasonal changes and developments in the wild community. At first the prime interest centers on identification, but as each step up the track yields an old acquaintance and friend, the attention is focused on the changes that twenty-four hours have wrought on that intimately known comrade under observation. I have found, through the year, that the best way to study and enjoy the natural world is to visit with it every day. Only then can a good friend become an intimate friend.

Not to be overlooked in the evaluation of my "Nature trail" is its use as a classroom teaching aid. While

the hazard of passing trains prevents organized field trips down the tracks, my classes seem to benefit from a brief resume of the morning's observations and happenings. The students, once aware of daily changes, begin to look for Nature's happenings in their own backyards, and on their farms. An occasionally interested student may be waiting to join me on the morning walk, his interest stimulated by what he has heard in class. All of us have some curiosity about our environment, the degree dependent upon the stimulus. Our railway community seems to be a potent stimulus, if judged by class response. The masses of steel, cedar cross-ties, and limestone that constitute our railways may well provide us with natural laboratories of equal value to the speed and convenience of transportation.



Cow Parsnip

By MILDRED FIELDER

HAVE YOU ever noticed a giant plant growing along the banks of small streams, sometimes eight feet tall and often four or five high? Its leaves are elephantine, often a foot or more long, and as wide as an apple pie. It flowers in a flat-topped cluster of tiny, white blossoms that, on dying, leave nothing particular of beauty to behold. Some people know this outsize stream-side plant as the cow parsnip, others call it beaver root. Botanists know it more precisely as *Heracleum lanatum*.

Whatever its name, two things are generally known about it today. You know you will find it in wet woodlands, preferably near a small stream; and its leaves are certainly not the best food for cattle or any other mammalian leaf-eater, and are said to be poisonous.

Back in the early days of American plains-life, when the red men and the white settlers had to turn to Nature for medicine, the cow parsnip was said to have certain medicinal values. Some of the Indians of the northern plains used a "smoke treatment" for specific illnesses—a fire was built and a blanket spread over both the patient and the smoking fire; so that the sick one inhaled the smoke. The flowering tops of the cow parsnip were used in such a smoke treatment for fainting and convulsions.

The root was used for other maladies. For boils, one could scrape the root or pound it fine, then boil the pulverized root stock to make a poultice.

The same root decoction boiled to a drinkable state, rather than thick poultice paste, could be used to treat intestinal pains, also. The fact that cow parsnip leaves are poisonous does not necessarily mean that the root is also dangerous, any more than it is in certain other plants. Perhaps it really helped. Who knows? ♥ ♥ ♥

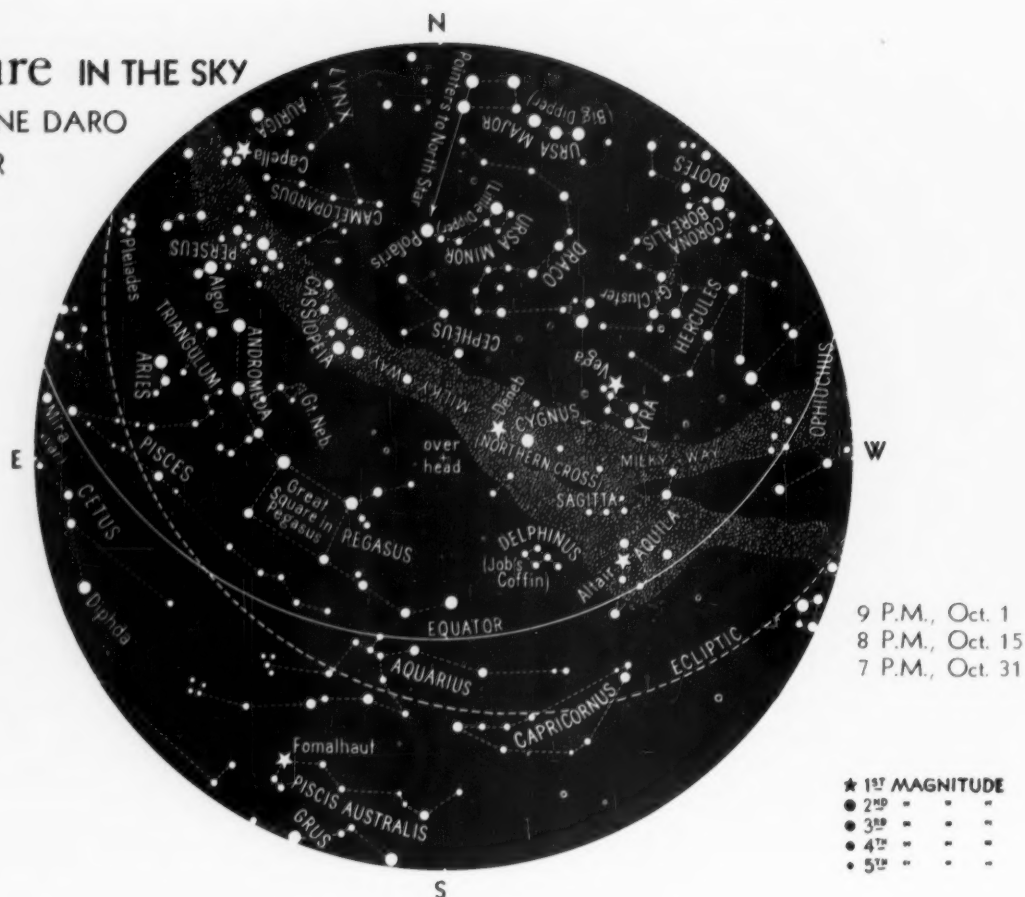


PHOTOGRAPH BY MARJORIE MORCOM

The cow parsnip, inhabitant of wet woodlands and stream-sides, was used medicinally in earlier days.

Nature IN THE SKY

By SIMONE DARO
GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the

map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Comet Arend-Roland

THERE are few observatories at the present time that devote any appreciable amount of time to a systematic search for new comets. However, at most observatories, the photographs of star fields taken for other purposes are also scanned, in routine fashion, to detect the possible presence of comets. Such was the case at the Royal Observatory of Uccle, Belgium, when, on November 9, 1956, astronomer S. Arend was inspecting a photograph taken on the previous night by his assistant, Roland. Arend's keen eyes detected a fuzzy image, which had all the characteristics of a comet. This was by no means his first comet discovery, and, if there was any excitement in his office that day, I would venture to say that Monsieur Roland was the one to feel it.

There was really nothing remarkable about that comet.

It was a compact one, of approximately tenth magnitude. In brief, just another comet. Its position was duly measured, and notice of the discovery was telegraphed to the Royal Observatory at Copenhagen, Denmark, which acts as a clearing house for the announcement of similar discoveries. The comet was given the provisional designation of 1956h Arend-Roland.

At least one astronomer must have received the announcement with mixed feelings. S. Kaho, of Konko, Japan, discovered that the comet was present on one of the photographs he had taken on the night of November 7. If only he had inspected it sooner, he might have been credited with the discovery.

By the end of November, enough observations of the comet had been obtained to compute a preliminary orbit

and to predict its position in the sky for the next few months. It became immediately apparent from the computations that the object might become very bright as it approached the sun. In a circular of the British Astronomical Association, published on December 4, 1956, G. Merton wrote: "A diagram of the orbit indicates that the comet may be a fine bright object, possibly of zero magnitude, for observers in the southern hemisphere before dawn during the first half of April, and for us in the north after sunset at the end of April and beginning of May [1957] after it has passed between the earth and the sun."

The prediction of the brightness of a comet as it approaches the sun can be troublesome. Not all comets behave in the same manner. There are two general laws that may be applied, one of which will, in most cases, yield the right answer. However, these laws are based on statistics rather than known physical causes, and it is not always possible to tell in advance which one to apply. Adding further to this uncertainty, Comet Arend-Roland proved to be variable in brightness. Merton had used the more optimistic of the two laws in predicting zero magnitude, but, in fact, the Comet never exceeded magnitude +2.

On the other hand, its other features provided ample compensation for the disappointment caused by its failure to reach the expected brightness.

By the end of April, 1957, the comet sported a magnificent tail spanning at least 25 degrees, of which more than half was visible to the naked eye. The actual length of the tail was estimated in excess of 20 million miles. It is not possible to give a precise value of this length, merely because the material in the tail of a comet thins out gradually, so that no definite boundaries can be assigned to it.

In addition to this spectacular tail, Comet Arend-Roland exhibited, also, something that astronomers—at a loss for a technical word—described variously as a "jet," a "spike," or an "antitail." Whereas the tail is always directed *away* from the sun, this unusual antitail pointed directly *toward* the sun. This phenomenon was relatively shortlived. It began forming as a stubby appendage, about April 22. By April 25 it had grown to a length of 15 degrees and was pointing directly at the sun. Three days later it had completely disappeared.

A similar occurrence was observed in the anomalous tail of the great comet of 1862. At that time, T. Bredichin, of the Moscow Observatory, suggested a simple geometrical explanation, which applies also in the case of Comet Arend-Roland. The appearance of the antitail is caused by the presence of cometary dust in the plane of the comet's orbit. The distribution of this dust in the plane could be compared to a thin and tenuous pancake. When seen broadside, the sun's light reflected by this "pancake" would be too faint to be seen. Seen edgewise, however, it would appear concentrated in a narrow spike, creating the impression of the antitail. This argument is greatly supported by the fact that the earth crossed the plane of the comet's orbit on April 25. Thus the orbit



This photograph of Comet Arend-Roland was obtained by Dr. Elizabeth Roemer on May 3, 1957, at the Flagstaff, Arizona, sub-station of the U. S. Naval Observatory. She used a 40-inch reflector. The streak of light cutting diagonally across the head of the comet is a meteor trail, a truly unusual occurrence on a comet picture.

was seen edgewise on that date, which is also the date of maximum development of the antitail.

The comet was still visible to the naked eye during the first week of May, after which it started fading away in its course toward the outer reaches of the solar system.

The computation of the definitive orbit of Comet Arend-Roland will not be performed until all data of observation have been reported and analyzed. But preliminary computations indicate that the orbit is extremely elongated, possibly even slightly hyperbolic. In consequence, Comet Arend-Roland must have a very long period and might not return for another thousand years, if ever. Its general appearance also suggests that this could have been its first trip through the solar system.

In this case, one might wonder where it came from originally. Astronomers are inclined to accept a theory formulated in recent years by Prof. J. Oort of Leyden, Netherlands. Prof. Oort suggested that the sun carries with it a huge swarm of comets extending from the confines of the solar system all the way out to the nearby stars. Once in a while, the perturbations caused by a passing star would alter the course of a comet in the swarm, and send it traveling (continued on page 445)

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Centennial of T.R.

OCTOBER 27, 1957, marks the beginning of the hundredth year following the birth of the 25th president of the United States, Theodore Roosevelt. There will be much said about the work of this man as a wielder of the "Big Stick" in economics and politics. There will be praise and criticism for some of the views he had on wildlife, on international affairs and on some other issues. It may be appropriate to devote this page to these subjects, but it is highly suitable that we call your attention to some of T.R.'s views on Nature study, on science teaching, and on education in general. Most of these are in complete conformity with the philosophy expressed on this page during past years.

Listen to the 25th President after he had had time to give some thought to what might have happened to him, and to us, had science and science teaching been different in his day:

"I fully intended to make science my life-work. I did not for the simple reason that at that time Harvard, and I suppose our other colleges, utterly ignored the possibilities of the faunal naturalist, the outdoor naturalist and observer of nature. They treated biology as purely a science of the laboratory and the microscope, a science whose adherents were to spend their time in the study of minute forms of marine life, or else in section cutting and the study of the tissues of the higher organisms under the microscope. This attitude was, no doubt, in part due to the fact that in most colleges then there was a not always intelligent copying of what was done in the great German universities. The sound revolt against superficiality of study had been carried to the extreme; thoroughness in minutiae as the only end of study had been erected into a fetish. There

was a total failure to understand the great variety of kinds of work that could be done by naturalists, including outdoor naturalists. In the entirely proper desire to be thorough and to avoid slipshod methods, the tendency was to treat as not serious, as unscientific, any kind of work that was not carried out with laborious minuteness in the laboratory. My taste was specialized in a totally different direction, and I had no more desire or ability to be a microscopist and section cutter than to be a mathematician. Accordingly I abandoned all thought of becoming a scientist."

Roosevelt was diverted

Thus did Harvard deprive science of an able and seriously dedicated worker and divert Roosevelt's energies and abilities to the field of social science. Thus are many schools and colleges changing able people from becoming workers in fields that interest them.

One can not help wonder what the dynamic Theodore would have said about the sham of much of our modern precollege science. In colleges all across the continent this year graduate students in education and in science education will be looking around for subjects for their theses. It might be appropriate for them to help make the Theodore Roosevelt anniversary significant by bringing together his views on science, on Nature and on education, evaluating all these in terms of modern situations. How, for example, would the progressive education idea have fared with T. R?

T. R. and T. V.

I shall return to this later, but I cannot help but wonder now how Theodore Roosevelt would have reacted to a television program in elementary science sponsored by the State Department of Education in his home State in which apparently the children did little but read a whole series of display cards, the

first one of which read: "The Little Plant. In the heart of a seed Buried deep so deep A dear little plant Lay fast asleep." If I can get my hands on the rest of that series of cards you will hear more about it from me later on. Why, oh why, should the advantages of television be so thoroughly abused as to be used to help children read a whole series of statements about science? Apparently the "dear little plant" referred to in the television lesson was a bean seed, in which the "dear little plant" occupies practically all of the seed and is hardly buried at all. But that is another story. In passing it should be noted that this much-touted lesson was elementary science and not Nature study.

A few more views from the dynamic Teddy might be appropriate at this time. In 1910 he wrote: "Nowadays the field naturalist—who is usually at all points superior to the mere closet naturalist—follows a profession as full of hazard and interest as that of the explorer or of the big-game hunter in the remote wilderness. He penetrates to all of the out-of-the-way nooks and corners of the earth; he is schooled to the performance of very hard work, to the endurance of fatigue and hardship, to encountering all kinds of risks, and to grappling with every conceivable emergency. In consequence he is exceedingly competent, resourceful and self-reliant, and the man of all others to trust in a tight place."

A man of broad views

We must recognize in Theodore Roosevelt a man of broad views for the most part. He would not defend the field naturalist who was merely a healthy, rugged, courageous animal. Speaking at Oxford University in 1910 he said: "I believe that as the field of science encroaches on the field of literature there should be a corresponding encroachment of literature on science; and I hold that one of the great needs, which can only be met by very able men whose culture is broad enough to include literature as well as science, is the need of books for scientific laymen. We need a literature of science which shall be readable."

Two years later, in his address as president of the American Historical Association in Boston, T.R. said: "I believe that already science has owed more than it suspects to the unconscious literary power of some of

its representatives. Scientific writers of note had grasped the fact of evolution long before Darwin and Huxley. . . Yet where their predecessors had created hardly a ripple, Darwin and Huxley succeeded in effecting a complete revolution in the thought of the age, a revolution as great as that caused by the discovery of the solar system. I believe that the chief explanation of the difference was the very simple one that what Darwin and Huxley wrote was interesting to read. Every cultivated man soon had their volumes in his library, and they still keep their places on our book shelves. But Lamarck and Cope are only to be found in the libraries of a few special students."

Earlier on this page I took the liberty of suggesting that some graduate students might help commemorate the hundredth anniversary of the birth of Theodore Roosevelt by writing some theses on his contribution to science and his interest in Nature and education. The subject matter is most interesting, the opportunity to get recognition of a work well done is superb. Let us hope that possibly out of this suggestion we can get at least one thesis that is "interesting to read." Its production will call for intelligence and hard work, and if it is integrated into current situations, as it might well be, it will require broad, fearless, mature understandings. There should be no law calling for the rejection of a thesis produced through the use of these talents.

The Theodore Roosevelt Centennial Commission, 28 E. 20th St., N. Y. C., can help in this connection. ♪

Challenge

(Continued from page 407)

Imported rats and mice flourish to the exclusion of the native rice-rat. Last, but not least, are the depredations of human visitors to the islands.

The thoughtful person is deeply impressed by the ruthless slaughter of the unique fauna of the Galapagos Islands. Is it not a sad commentary on human intelligence that these strange creatures, which still decorate our world like exotic flowers, are within a few years of being completely destroyed?

It is not yet too late for effective action. There are still considerable numbers of marine and land iguanas, penguins, cormorants and tortoises remaining on some of the islands.

During the second world war, planes crossing the islands discovered, in the higher parts, bodies of water where the tortoises still congregate as they did when Charles Darwin visited the islands. But how much longer will they survive, now that their presence has been revealed to the settlers?

What, then, can be done? We realize that effective measures for the protection of Galapagos wildlife can only be carried out by someone on the spot. It seems to me that what is needed, first of all, is a well-equipped biological station somewhere in the islands, a station that could not only furnish protection, but also a wealth of new information concerning the species of the Galapagos. And there is much work yet to be done.

Toward this end, I submitted a memorandum to the International Union for the Conservation of Nature (IUCN) in Brussels, Belgium, pointing out the urgent need for such a biological station. The Union approved the plan, and agreed to support it. It approached the government of Ecuador on the subject, and Ecuador's minister of education has made an appeal to the UNESCO for the means to build and man such a scientific station. In view of the already-mentioned tendency to advertise the Galapagos Islands as potential attractions for the tourist trade, let us hope that the efforts of these agencies will be successful.

Many individuals and societies concerned with the problems of conservation, both in Europe and the United States, have lent their support to this plan for the salvation of Galapagos Islands wildlife, and I would like to thank those of both continents who have contributed both effort and ideas to the project. It is possible that the remarkable mammal, bird and reptile population of these lonely islands may yet be saved from extinction. ♪ ♪ ♪

Cape Cod

(Continued from page 410)

gift to the Federal Government. This contribution could be made by the State, the towns, by private individual donor, or by a combination of all these agencies.

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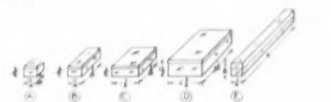


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THE Nature CAMERA

By EDNA HOFFMAN EVANS

Importance of the tripod

THIS TIME I AM going to write about a piece of photographic equipment that I have mentioned very seldom up to now. That piece of equipment is a tripod.

While it is not absolutely a "must" photographically, the tripod is a mighty useful item under certain circumstances. Also, with the new aluminum models that fold up small, extend large, and give solid support without much weight, the tripod is not such a burden to carry around as it once was.

My first tripod was a brass-and-wood affair, a converted surveyor's transit base, solid as a granite boulder and just about as heavy. I got it so as to have a firm foundation for the Graflex, and I ended by almost discontinuing the use of both camera and tripod because the combined outfit was so heavy and so cumbersome.

My second tripod was a light pre-war Japanese model, wobbly and apt to go spraddle-legged when I least expected such behavior. As a result, I did not use it very often, either.

My third (and current) tripod is small, light, and sturdy. It cost more than the other two, but is proving useful and usable, so in the long run I feel that the extra cost is well worth the final result. It is not the most expensive on the market (some of the present models are really fancy) nor is it the cheapest. It is a Whitehall Travelite, Model TR-1, made by Quick-Set, Inc., in Skokie, Illinois, and it cost somewhere between \$15 and \$20.

Why a tripod?

Now, why is a tripod a good item for a photographer to have? Here are some of the reasons.

Good Nature pictures are not "accidents." Good Nature pictures are anticipated, planned for, and in some cases even "staged" as carefully as a movie scene. After years of trying to capture Nature on the wing, I have come to the conclusion that I must be more subtle if I want the best results.

It is one thing to take a Nature walk and observe the mammals, birds, insects, and plants visible in such a setting. It is quite another thing to take pictures. You cannot aim a camera as casually as you can a pair of bird glasses—you cannot, that is, and get anything like recognizable results.

To give several examples—first of the can-nots, and then of the cans.

The other day I went out and sat down on a concrete block in the far corner of my parents' property in Florida. It is part greenhouse, part orange grove, part just plain wilderness. I sat for a couple of hours, perhaps, just watching for what I could see.

I watched a cardinal feed one of its youngsters—the baby was mature enough to fly, but still quite willing to have "mom" or "pop" stuff food down its hungry gullet. The meal was transferred while the birds perched on a horizontal sprinkler pipe about 20 feet from me.

After that, I watched a red-bellied woodpecker eat an orange hanging high up in the tree. The bird clung to the fruit and thrust a hungry beak into the soft, juicy pulp. From the looks of the orange, it had already been on the menu for several meals.

Then there were bluejays to watch—cocky fellows hopping here and there among the tree branches and alighting on the rafters of the greenhouse. The glass roof was slippery footing, and I enjoyed the acrobatics that resulted when a jay landed down the slope.

After I had been sitting for some time, a squirrel discovered me, and began scolding. He came from the oak trees on the adjoining property and approached cautiously, peering down at me and jerking his tail in time to his scolding monologue. When I made no move in any direction, he apparently decided that I was a part of the landscape, and moved on to more interesting scenery.

There were butterflies to watch, several different kinds of them, from a big black-and-gold model to a smaller dusty yellow one. They flitted here and there in a seemingly aimless manner, now high as the tree top and now close to the ground, never pausing long on any perch, but interesting to watch be-



This toad and toadstool scene was photographed on the same "stage" as was the baby mockingbird described in the story. The principles involved, and the advantages to be gained by having a semi-permanent setup where conditions can be controlled, are the same. The only difference is that the toad was recorded on black-and-white film while the mocker was pictured on Kodachrome. The latter was, thus, not so readily available for illustration purposes.

cause their movements seemed so effortless.

Hummingbird arrives

Then, from somewhere over the greenhouse, a hummingbird flew into the scene. This was a female, for she lacked the metallic red throat that is the beauty spot of the male member of that family in Florida. With wings nothing but a blur, and with the flecks of sunlight through the leaves glinting on the green feathers of her back, she investigated each of the flame-colored flowers on the clerodendron bush that was even closer to me than the cardinals had been. Then she drifted on, moving dot-dash fashion as do her kind. They hang motionless for a time in one place and then, without any apparent change of wing pitch, they are suddenly somewhere else entirely.

A mockingbird flew in and out of the scene several times, perching high and then dropping low to catch something in the grass that my sight was too slow to detect.

Through it all I wondered from time to time "Where are the chameleons?" meaning members of the genus *Anolis* that are so numerous around the greenhouse. Finally I saw one, in the brown-and-tan color phase. It came from the ground somewhere, and crawled with extreme caution up one of the lath strips that shade the greenhouse. It chose each foothold so carefully that I was quite sure the climb was a difficult one. Then something startled it, and away my brown lizard dashed, scampering along so fast that it almost seemed to be running on air.

Wild and happy

I do not know what frightened that brown individual, but no sooner had it disappeared than another of its kind, wearing bright green, swaggered onto the scene, pausing now and then to swell out his scarlet throat. I wondered whether it was his approach that had caused the other's flight. Chameleons (I think of them by that name) are such jaunty creatures when, in green and scarlet pride, they survey their free domains. In their native habitat they are so different from the dejected looking captives I see each year—chains around necks—at the Arizona State Fair.

I never discovered just why the second lizard was making such a colorful display, unless he was try-

ing to outdo a third red and green fellow, who by this time had appeared on the opposite wall of the greenhouse. By the time these two had begun their throat-swelling rivalry, I was called for lunch and my observations ceased.

And now to draw the obvious conclusion from the foregoing. My eyes had seen and my brain had captured and retained much that my camera could never hope to record. While the "stage" was small, the action shifted rapidly—now close, now distant, now low, now high, now in the sunlight, now in the deep shade. I had no control over it, and could not have followed it with a camera had I wished to do so. Not even a "blind" setup would have allowed me to picture the activities I had witnessed. They happened too fast, and too unpredictably.

Now to return to the tripod and one of its uses, and to illustrate how Nature can be "captured."

During the summer I keep a more or less permanent stage set up in the study. I use a drawing board as a base, a bath towel draped over the bookcase for the background, some aluminum foil reflectors and a couple of photoflood lamps within easy reach. I know the exposure, and can control the light. There is little or no guess-work to photographing whatever I choose to place on that stage.

Actors are not hard to find. For example, the other day, as I finished trimming the grass along the front walk, I happened to glance at a bush, nearby. Perched in it was a baby mockingbird. How long he had been there I do not know. But he was staring at me, round-eyed, with that disapproving expression all baby birds have because of the way the corners of their big mouths droop. I ran and got my camera (I had to unhitch it from the tripod) and photographed him in place, using my medium-close attachment. Then I switched to my very closeup one and thereby scared him off his perch.

Ham actor

It was not difficult to catch him, since he was still too young to fly. So I carried him indoors and perched him on a twig in my "stage" area. He perched well, too, as soon as I discovered that the twig had to be firmly anchored at both ends. As long as it was shaky he refused to

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stay put. He posed for me for a half-hour or more, while I took several pictures on color film. Finally, though, he must have heard a noise outside, for he began squawking for his mother. No more posing for him, so I carried him back to his bush, and watched until his mama came along and fed him.

The point is: with the camera on the tripod, I had my hands free to do all the other things necessary to baby bird or any other kind of photography. My subject's range was restricted, although the bird was in no way constrained. My photographic conditions were constant. It was an altogether different sort of situation than the one I described outdoors.

I have taken to using the tripod more and more, even for landscape pictures and other scenes. With a short cable release there is no danger of jarring the camera when pressing the trigger and, once set, there is no need to worry about the position of the horizon or any other factors that are so easily sent awry by even the slightest camera movement.

So, all things considered, I think the tripod has become a very important—and highly dependable—piece of photographic equipment for me.



Mitchell

(Continued from page 432)

higher and better claims, which are universally and cheerfully acknowledged by all, to be forever remembered in connection with the Black Mountain. . . (Clingman) could not possibly know when he first ascended it that anyone had visited or measured it before him, nor have any intention to do any injustice to Dr. Mitchell. . ."

Weighing the evidence, the U. S. Geological Survey (1881-82) adopted the name Mount Mitchell, by which it has been known since.

Elisha Mitchell's mountain, elevation 6684 feet, stands today as the highest point east of the Mississippi River. In 1915, exactly a century after Mitchell first came to North Carolina, a portion of the mountain, including the summit, was purchased by public funds and set aside as Mount Mitchell State Park—the first State park to be established in North Carolina.

A paved road, leaving the Blue Ridge Parkway north of Asheville, leads to the summit. Picnic areas

with shelters, tables, benches, water and fireplaces are available. A refreshment stand serves coffee, cold drinks, sandwiches, and souvenirs during the summer and a restaurant is operated in the recreation lodge from May 15 to October 15.

Foot trails lead through the mountain vegetation and a park naturalist is on duty during June, July and August at the museum to assist visitors in an understanding and enjoyment of the area. A stone observation tower permits unlimited views of the Great Smokies, the Blacks, the Craggies, the Blue Ridge—the splendid mountain country of the Southern Highlands.

But still the pervading spirit of Mount Mitchell is the man whose accomplishments it commemorates. As the wind sings through the firs where Elisha Mitchell made his first observations, it sounds today a wild and natural tribute to the man who gave his life a hundred years ago in the haltless pursuit of science.

Elephant

(Continued from page 404)

It was not until 1804, five years after the disappearance of the Crowninshield elephant, that another elephant was exhibited in America. This one was described as being newly arrived in Boston from the East Indies, accompanied by a native Bengali.

Regardless of what finally happened to the Crowninshield elephant, she *was* the first elephant in America during historic times. As such, she afforded countless thousands of solid citizens their first and only sight of an elephant—a remarkable sight indeed. As far as they were concerned, it was a sight they would never forget.



Woolly Bear

(Continued from page 419)

every day, leaving their cage partly in the sun and partly in the shade, for they could not stand the sun too long at a time. From October 3 to November 11, they had consumed one bunch of Chinese cabbage, one bunch of romaine, three heads of lettuce, five heads of cabbage and a few leaves of mustard.

By November 13 they had slowed up in their eating and their molting, preparatory to entering the chrysalis stage. On November 15, several showed up with cinnamon hairs all over, and the largest ones developed

bands of dark blue across their backs. Then some became yellow-backed, while others stayed black.

For the next few days, I hurriedly removed the yellow ones to another cage, to try to determine later whether they were males or females—only to find, next morning, that they had shed their yellow skins, and were again black.

The first chrysalis appeared November 17, neatly covered with a little, gray blanket, and the chrysalis and blanket were fastened under a leaf. Each caterpillar became more and more sluggish before it shed its final caterpillar skin and became a chrysalis, and thus came to an end the babyhood of seventy-nine woolly caterpillars.

Millions of years before man appeared upon earth to cultivate cabbage patches, the ancestors of the mustard or cruciferaea plant family thrived abundantly. And among the insects that helped keep this family under control were the ancestors of the woolly caterpillar. Small wonder, then, that these enterprising insects invade man's gardens today!

The last of my caterpillars were in their cocoons by December 7, where they hibernated until spring. The first moth that emerged on March 23 was a female. Several others emerged, but most of them did not. Hidden under the leaves, they lay in various stages of transformation, dead.

When my caterpillars had tried with so much animation to run away, they had been impelled by the instinct for self-preservation. They needed exercise, the moisture of the earth, and the struggle for existence, in spite of all its dangers. Robbed of these, with the best of care, they lacked the vitality and strength required to shed their skins, and perform the other wonders of transformation. It is possible, however, that some may have been victims of parasites.

Some died in the difficult process of shedding their last caterpillar skins. Others died with their little blankets half-woven. And more died imprisoned in their cocoons, too weak to break out in the spring. Those that did emerge as moths were frail creatures, the products of regimented and artificial living, without freedom of action and choice. Perhaps it would have been better had I destroyed the mother's eggs, that October morning when I found them on the porch.



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Rambling

(Continued from page 414)

permanent file. Next morning it was the hermit thrush who was so excited over his courtship that, ignoring us, he alighted on the rim of the reflector two feet from Norma's face.

Possibly the hermit thrush we recorded on Whiteface Mountain, in the Adirondacks, was a somewhat better singer, but the Poconos bird was our first love. Whiteface also is remembered for an olive-backed thrush, for the wild strawberries Norma ate while waiting for the olive-back to complete his singing circuit and come back in reach of the mike; for the spotted fawn she scared up one morning while crossing the grass-covered ski-run; and, most of all, for the little purple finch who sang his heart out. The morning after we had recorded his unusually fine song, we found him dead under his favorite song-perch in a pine tree.

We spent three springs and summers recording in the West. We had not only a larger territory to cover, with perhaps as many bird species—though fewer individuals—but also the terrain was so much more varied, from vast, high plains to rugged mountains, and from driest deserts to the densest and tallest trees.

House finches sang for us at Fort Davis, in west Texas. These pleasing singers are almost as common as house sparrows in many parts of the West. Canyon towhees sang for us, but our star was a canyon wren at Mitre Peak Girl Scout Camp, between Fort Davis and Alpine. First he sent his silvery notes cascading from the top of the canyon wall. We recorded every note. Then the obliging mite came down to a boulder, only forty feet away, and repeated his concert. These wrens seem to have at least three styles of delivering their descending scales, not greatly differing. It is the sweet, ringing quality of the song that is so breath-taking.

We would like to protest the new idea of lumping green-backed and Arkansas goldfinches under the non-descript term of *lesser* goldfinch. According to our observations, somewhat limited though they may be, these birds not only look differently, have different ranges and preferred habitats—green-backs in trees, the Arkansas in meadows—but also have different songs. The only Arkansas

goldfinch we have been able to record sang from a fencepost by a stream near Walsenberg, Colorado. But those we heard near Kerrville, Texas, had similar songs.

One of our favorite desert recording sites was Coon Bluff picnic ground near Mesa, Arizona. We never found any human occupants there on week days. The clear Salt River flowed quietly, and the bluff sheltered us from traffic noises and breezes. Here we recorded the only phainopepla we ever heard really singing. The dawn song of an ash-throated flycatcher and a bit of Arizona cardinal used on our western record also came from this place. Saguaro and mesquite were dominant plants here, as they were in Sabino Canyon north of Tucson, where a Palmer's thrasher sang for us at fifteen feet, and at Saguaro National Monument, where we got some of our Gambel's quail talk.

Our good luck in recording around Tucson owed much to the Erl Mortons, who introduced us to the right places and people, from the owner of Agua Caliente Ranch to a helpful Indian on the reservation. The Morton's suburban patio, canopied by red-fringed bottle-brush trees, was the recording site for our Gambel's sparrows, more Gambel's quail, an Inca dove and a cactus wren.

Songs of varied thrushes were heard in many scenic areas of the northwest—along Stevens Pass on U. S. Highway 2, in north-central Washington; on Mt. Baker in north-west Washington, where snowbanks were higher than the top of the car, and along the higher roadways of Mount Rainier. But all these were heard much too faintly, above cata-racts swollen by melting snow. We finally recorded one at Baker Lake and another at Santiam Pass above Sisters, Oregon. Some of the long, quavering notes of the varied thrush are pleasing, and some have a rough quality, sounding rather as if two discordant pitches were being given at the same time.

A few of the really good singers still elude us. Townsend solitaires are partial to high mountain bluffs, and it seems to us that they prefer those of mountain roads less than two cars-widths wide, where the sides go straight up and down. Or else they sit and repeat their single call notes over and over; but they never sing! During our three years of recording in the West we saw about twelve or fifteen solitaires,

but never heard one sing until last fall near Albuquerque, though we failed to record him. At Cave Canyon, in southeastern Arizona, we located seven solitaires, and the best any of them would do for us was repeat *toop—toop—toop—toop*, now softly, now loudly, but never varying in time or pitch. We hunted for solitaires twice, in different years, in Mill Creek Canyon near Redlands, California, and we made a special trip back to Big Bear Lake, in March, before the snow was gone from that 7000-foot elevation. A few call-notes were all we heard.

We are discouraged about dippers, also. Their high, thin warbles are practically lost in the roaring waterfalls they always seem to prefer. We heard a beautiful song from a pine grosbeak once, in the mountains south of Pendleton, Oregon. A dog barked without pause, and the bird soon flew away.

It was during the 1949 spring census in The Valley that Guy Emerson, retired New York banker and dean of the bird listers, told us he estimated it would take us about ten years to record a representative collection of bird songs of the United States. We feared we would run out of both energy and money before them. We had said from the first that we would stay in this country, and also that we would leave the really rare birds to the endowed professionals—unless we just happened to run across a rare one, of course. That was nine years ago. Whether or not our collection deserves to be called "representative," at least we have not run out of possibilities. To be sure, many of the 700 major species of birds in this country are not classed as singers, and some are almost voiceless. Our doves and grouse are not as loud as we would like—probably we should have a larger reflector for those low pitches. We have scarcely started on the water and shore birds. Plenty of possibilities await our still-willing spirits. Bird recording is fun! ♪ ♪ ♪

New Trees

Seedling tree production for reforestation in Alabama last year amounted to about 62 million trees—enough to supply only about half the demand. This year, says Alabama State Forester J. M. Stauffer, the production of seedlings will total almost 100 million trees, and the Forestry Division already has on hand orders for nearly 150 million.

Surf

(Continued from page 424)

and scores of people have rung our doorbell, asking if they might have a closer look. We have even been surprised to open the door and find a uniformed policeman from a prowler car wanting to come in and see the mural.

However, I think we were proudest when a lady who had moved to Tucson from the California coast stopped by.

"I have never seen such wild beauty in a photograph before," she said. "Would it be possible for me to have a photomural just like it? I will never be able to live by that beautiful sea again, and this scene would help quiet my 'sea-fever'."

The lady now has her photo-mural, and Phyllis and I feel that bringing the surf to the Arizona desert has been very much worthwhile. ♀♂♂

Comet Arend-Roland

(Continued from page 437)

within the solar system.

Comet Arend-Roland has been one of the most widely observed in the history of modern astronomy. No doubt much will be learned from its visit, concerning the formation of a comet's tail, the nature of its nucleus, and its contribution to meteoric streams and the zodiacal light.

In the month of October, the moon will be full on October 8, and the New Moon will occur on October 23.

A total eclipse of the sun will take place over Antarctica on October 23. The total phase will be visible only in a small area off Bruce Coast, in the Weddell Sea. This region is unfortunately among the least accessible of Antarctica. Although the effects of the eclipse on the upper regions of the atmosphere will be observed from some of the bases established there for the International Geophysical Year, it is unlikely that the total phase will be observed on the earth's surface.

Mercury will be a morning star, rising in the east one and one-half hour before the sun on October 1. It will then move closer to the sun and will enter the evening sky on October 24. Therefore it will be most suitable for viewing on the first few days of that month.

Venus will be a brilliant evening

star during all of October, setting approximately two hours after the sun. Look for it low in the southwest after dark.

Mars, in the morning sky, is faint, and will be too close to the sun during most of October to be found easily.

Jupiter will also be a morning star. By the end of October, it will rise in the east nearly two hours before sunrise.

Saturn, low above the southwestern horizon, will set about two hours after the sun on October 15.

The Orionid meteor shower is expected on October 20, with a maximum zenith rate of ten per hour. The moonless night should favor observations. ♀♂♂

Foresters Meet

The fifty-seventh annual meeting of the Society of American Foresters will be held in Syracuse, New York, from November 10 to 13, with an anticipated attendance of more than a thousand American and Canadian professional foresters, their wives, and guests. Dr. Fairfield Osborn, president of the Conservation Foundation of New York, will be the principal speaker, while Maurice K. Goddard, secretary of the Pennsylvania State Department of Forests and Waters will act as toastmaster. The various technical subjects for discussion—like forest management, silviculture, range management, watershed management, private forestry, and others—will be tied together under the general theme of this year's meeting, "Forest Land Use in Transition."

New Pulp Crops

Considerable experimentation has been under way in Florida on the growing of bamboo and eucalyptus wood for pulp, reports *Forestry Digest*, organ of the American Forest Products Industries, Inc., of Washington, D. C. At Fort Myers, a eucalyptus tree has reached a height of 48 feet in two and a half years, and the rapid growth of this tree, plus its excellent pulping qualities, may some day make it a challenger to the southern pine in the paper manufacturing trade. Bamboo can be reduced to pulp with less consumption of chemicals, and bleaches more easily than other common raw materials, according to the experimenters, who point out that it can be harvested on an annual-yield basis.

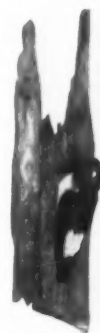


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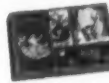
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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Family Album

8. Projection Machines

BACK IN the days when Darwin was publishing his *Origin of Species* and Thomas Henry Huxley was debating with Soapy Sam Wilberforce on the merits of the new concept of evolution, a favorite gadget for entertainment in the parlor of an evening was the magic lantern. How marvelous to see, projected on the wall or on a bed-sheet hung up as a screen, views of the Grand Canyon or the enlarged delineations of a flea! In time, this device became the projection lantern and no lecture on the natural sciences was complete without one. The oil lamp gave way to the electric bulb or arc lamp, but the progenitor of modern projection devices would be hard put to recognize its numerous offspring: the current models of still projectors, motion-picture projectors, CinemaScopes, Todd AO, microprojectors, and a host of others, notably the popular Kodachrome projectors.

The magic lantern was first exhibited, according to Gage and

Gage (*Optic Projection*, Comstock, 1914) by the Danish mathematician, Walgensten, in 1665. It consisted of a lamp housing containing a candle with a reflector in rear, an aperture for the light fitted with a projection tube, containing the object and a biconvex lens. Such a device will throw an enlarged and inverted image on a screen in a darkened room, and any boy may make one with ease, and many have done so from that day to the present.

Illumination sources went through a long evolutionary period, keeping pace with inventions of illuminants for general purposes. Brightest of all known sources is direct sunlight, but this may be employed only in the daytime and under special conditions. A clock-driven heliostat regulates the angle of a mirror used in directing the sun's rays upon a screen. Artificial illuminants tried included the now outmoded lime light, alcohol lamps, gas burners of many types and acetylene lamps, but in the present century operators soon adopted one form or another of electric lamps. Arc lamps give brilliant lighting, but require a clock-feed

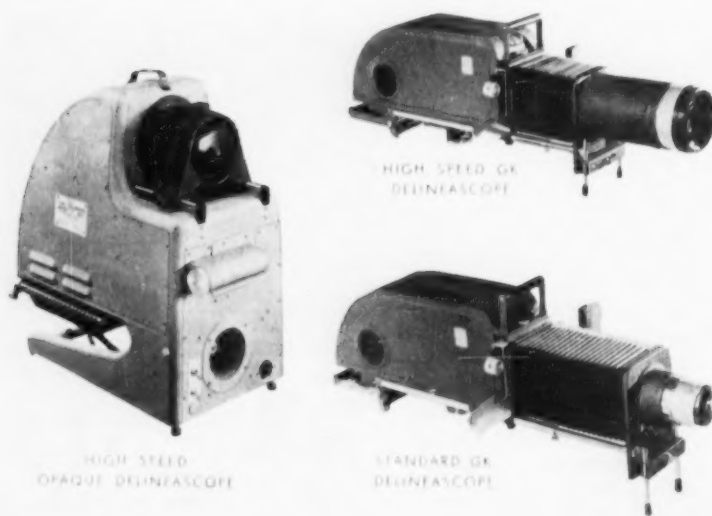
mechanism for the two carbons, usually with more or less constant attention. Modern 500 to 750 watt bulbs, for auditorium use, are now well nigh universal.

The law that the amount of illumination per square foot varies inversely with the projection distance needs no knowledge of physics for appreciation by even the rankest amateur; he would know, from a common-sense view, that the farther the screen the dimmer the light. Then he may take a course in general science or elementary physics and learn just how alarming this diminution of the lighting becomes; it varies inversely with the square of the distance, an easily proved proposition, and one that causes us to marvel at the brilliance of the screen in such situations as the outdoor drive-in movie, where the projection distance is great, the screen enormous, and the interference from unfavorable surroundings apt to be considerable.

Heat a problem

The terrific heat generated by powerful illuminants has ever been a problem. A partial solution, still seen in some assemblies, was the introduction of a water cell between elements of the condenser, absorbing many of the unwanted heat rays. Today a small motor-driven fan ventilates the lamp housing, blowing the heat away as it accumulates, although adding to the cost of the outfit. Larger assemblies include, in addition, an infra-red absorbing filter in the condenser system.

Another matter of common experience is that the size of the image varies directly with the projection distance. We can move the lantern farther and farther away from the screen and obtain progressively increasing sizes of the image. But it may be that we wish to place the machine at the rear of a long and narrow room, say forty feet from the screen, yet the greatest dimension for a screen would be ten feet square. This calls for a calculation to determine the proper objective to employ. Another situation might be one demanding a short distance and still a large image, possible if a different objective is used. Accordingly, the optical companies provide a number of different projection objectives, varying in focal length. Commonly they are fully corrected and employ from two to four elements.



Three new models of American Optical Company's projectors.

The condenser was early recognized as essential in any instrument beyond the toy class. It is a separate microscope, in fact, placed between the lamp and the object, and designed to make the diverging rays of light from the illuminant parallel and then to converge them upon the objective. Two or three lenses are used, plus any cooling device, such as an infra-red filter. Either the lamp housing or the condenser must be movable, to adjust for proper distance between them.

The object, let us say a lantern slide, is placed between the condenser and the objective. Its location is usually stationary, whereas the objective must slide back and forth in order to secure the desired focus. The lantern slide carrier accommodates two slides, the one in projection, the other ready to replace it. Manipulation for focusing may be done by a coarse adjustment knob, by pushing the objective in or out of its tube by hand, or by extending the whole forward housing, arranged as a bellows draw. Various adjustments permit leveling the apparatus or raising and lowering the front end.

Centration important

Centration is of prime importance; we must have the center of the lamp, of the condenser, and of the objective all aligned on the optical axis of the instrument. This means that the base or metal framework constitutes an optical bench, along which the movable parts slide in grooves. Centering screws provide for correct adjustment, especially of the lamp.

Each manufacturer has his own trade name for the slide projector; Balopticon (Bausch & Lomb), Delinascop (American Optical), and so on. Recent years have seen a flood of new organizations entering the field in connection with the popular 2 x 2 transparencies. Most models today are designed for either transparent or opaque projection, the combination instrument having proved less satisfactory than separate ones. Opaque projectors require more brilliant illumination than for transparencies, 1000-watt bulbs, for example. Such materials as photographs, drawings, paintings, illustrations in books, maps, stamps, coins, and small solid objects may be shown enlarged on the screen. They are placed flat upon a tray

whose springs permit lowering for insertion of specimens and, when released, press the tray into position against the frame to prevent loss of light. The lamp reflector directs rays downward upon the object, whence they are reflected upward to a 45° mirror, and then horizontally through the optical system to the screen. A fan keeps the material cool.

Dissolving views for slide projection involve two instruments, one above the other. An iris diaphragm on each is provided and these are so connected by a vertical bar that raising or lowering the bar, alternately, slowly closes the iris on one machine while opening the other. It can be understood that such an outfit almost doubles the cost.

Most modern transparent projectors are made to handle all three of the current sizes of slides, 2 x 2, 2 3/4 x 2 3/4, or 3 1/4 x 4 inches. Certain older models provided an attachment to project microscope slides, but these were never very satisfactory as subjects were limited to relatively large objects, as chick embryos. If such slides are to be projected, a regulation microprojector is necessary; it is the same sort of instrument in basic design, but requires short-focus objectives. Likewise when images are to be projected downward upon a table for making drawings or upon a sensitized plate for photography, it is far better to have an apparatus especially designed for these specialized purposes. Such items will be discussed in later articles.

The Microscope Makers IV. Ernst Leitz the third

IN THE October, 1956, issue, copy for which was prepared several months earlier, we concluded our historical sketch of one of the world's leading optical organizations, the firm of E. Leitz, Inc. We could not know that, as we wrote, the senior Ernst Leitz was enduring his final illness and that Wetzlar, Germany, was soon to prepare for the funeral of its leading citizen. A short notice appeared in our columns for June-July, 1957, and meanwhile we wrote the organization for particulars as to present management and the role to be played by the three surviving sons. This information is now at hand.

After the death of Dr. h. c. Ernst Leitz, Sr., on June 15, 1956, his sons,

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Ernst, Ludwig, and Guenther took over the management of the company. Dr. h. c. Ernst Leitz (the third of the name), and the oldest son, is President. He received an honorary doctor's degree from the Justus-Liebig-Hochschule Giessen during the one hundred years anniversary of the Leitz firm, which was founded in 1849. He is also honorable senator of the Technischen Hochschule Darmstadt. Within the framework of top management problems, he is particularly concerned with manufacturing problems and organization, with improvements in manufacturing processes, and with social questions. After the end of the last war he was instrumental in the political reorganization of the city and county, and has for years been active as Councilman of the City of Wetzlar.

Dr. h. c. Ludwig Leitz concerns himself primarily with problems of design and research. The scientific and technical laboratories are under his direction.

Guenther Leitz, the third son, is at the present moment, the Director of the Leitz factory at Midland, Ontario, Canada.

Review History

It is not often that we have had the privilege of reviewing a book that has the fundamental significance to microscopists as does *Robert Hooke*, by Margaret Espinasse, lecturer in English at the University of Hull,

Yorkshire, England. On the title page appears a quotation from Dryden, "Too little and too lately known," which sets the stage for this critical study of one of the most neglected yet most important and controversial figures of the seventeenth century in scientific England. Thirty years ago the student who took a course in the history of science

or of biology would have heard the name barely mentioned as the scientist who first gave the name *cell* to the biological unit. Today it is very different as one historian after another has uncovered the real facts in the life and work of this amazing man. The present book is thus most timely.

Who did the real work on which

Boyle's laws are based, thus initiating modern chemistry? Was it Boyle or Hooke? Who did the spade work for the law of gravitation? Was it Hooke or Newton? Who invented the spiral spring and the anchor escapement which made the watch possible—was it Huygens or Hooke? And who drew up the plans for the rebuilding of London after the great fire of 1666; was it Sir Christopher Wren or Hooke? This is not to say that the answer in any of these cases must be one or the other, but the list indicates that the subject of this biography was no second-rate personage. He knew everyone and had his finger in nearly every pie. He is the originator of the universal joint, the iris diaphragm, and countless other inventions, great and small.

Hooke's relations with Newton as revealed by the author throw an entirely new light on this important chapter in science history. Hooke's *Micrographia* (but one of very numerous publications), his relations with and lifelong service to the Royal Society of London, his worth as an architect and engineer, his social life, his home life, and his chronic state of ill health are all sympathetically discussed, thoroughly documented. To read this little book is to journey back to the days of the Restoration, when Charles II was showing a deal more tolerance than his predecessors, when Louis XIV was becoming the grand monarch and Harvard College was in its infancy; the days of Rembrandt, Milton, Moliere and Racine, the days when Leeuwenhoek was writing his astounding letters to the Royal Society, announcing the discovery of so many new subjects beneath the microscope.

Robert Hooke was a genius, excelling in many fields. The author finds that he was not the recluse or the eccentric or crabbed individual that some of his detractors attempted to state; quite the contrary. He was, she thinks, the most brilliant of all the galaxy of Restoration scientists, Newton not excepted; a biologist, meteorologist, astronomer, horologist, physicist, chemist, engineer, architect, surveyor, and inventor; clearly a man everyone should know.

Pp. xii, 192, plates 16, with 28 photographs. Univ. Calif. Press, 4c Berkeley, Cal., 1956. \$3.75.

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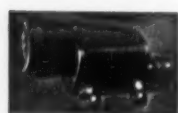
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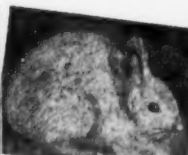
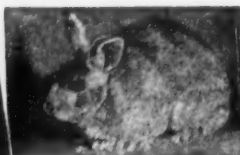
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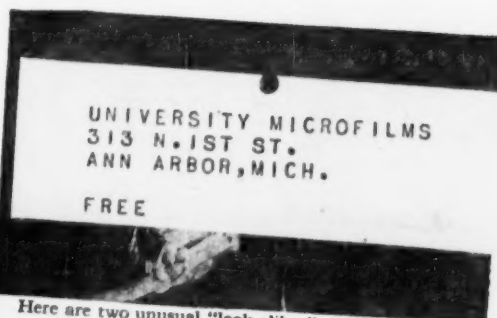
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